AVT Prosilica GC

Technical Manual

AVT GigE Vision Cameras

V2.0.6

05 July 2013

Allied Vision Technologies GmbH
Taschenweg 2a
D-07646 Stadtroda, Germany

ALLIED Vision Technologies

Legal notice

For customers in the U.S.A.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interferences will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Use a different line outlet for the receiver.
- Consult a radio or TV technician for help.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment. The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart A of Part 15 of FCC Rules.

For customers in Canada

This apparatus complies with the Class A limits for radio noise emissions set out in the Radio Interference Regulations.

Pour utilisateurs au Canada

Cet appareil est conforme aux normes classe A pour bruits radioélectriques, spécifiées dans le Règlement sur le brouillage radioélectrique.

Life support applications

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Allied Vision Technologies customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Allied Vision Technologies for any damages resulting from such improper use or sale.

Trademarks

Unless stated otherwise, all trademarks appearing in this document of Allied Vision Technologies are brands protected by law.

Warranty

The information provided by Allied Vision Technologies is supplied without any guarantees or warranty whatsoever, be it specific or implicit. Also, excluded are all implicit warranties concerning the negotiability, the suitability for specific applications or the non-breaking of laws and patents. Even if we assume that the information supplied to us is accurate, errors and inaccuracy may still occur.

Copyright

All texts, pictures and graphics are protected by copyright and other laws protecting intellectual property. It is not permitted to copy or modify them for trade use or transfer, nor may they be used on websites.

Allied Vision Technologies GmbH 07/2013

All rights reserved.
Managing Director: Mr. Frank Grube
Tax ID: DE 184383113

Headquarters:

Taschenweg 2a
D-07646 Stadtroda, Germany
Tel: +49 (0)36428 6770
Fax: +49 (0)36428 677-28
e-mail: info@alliedvisiontec.com

Contents

Contacting Allied Vision Technologies 5

Introduction 6

Document history 6
Conventions used in this manual 7
Precautions 8
Cleaning optics 9

Conformity 11

Specifications 12

Prosilica GC650/650C 12
Prosilica GC655/655C 14
Prosilica GC660/660C 16
Prosilica GC750/750C 18
Prosilica GC780/780C 20
Prosilica GC1020/1020C 22
Prosilica GC1280 24
Prosilica GC1290/1290C 26
Prosilica GC1350/1350C 28
Prosilica GC1380/1380C 30
Prosilica GC1380H/1380CH 32
Prosilica GC1600/1600C 34
Prosilica GC1600H/1600CH 36
Prosilica GC2450/2450C 38

Camera attribute highlights 40

Filter 41

Camera dimensions 42

Prosilica GC750, GC1280 42
Prosilica GC CCD models: 43
Tripod adapter 44
Adjustment of C/CS-Mount 45

Camera interfaces 46

Status LEDs 46
Gigabit Ethernet port 47
Camera I/O connector pin assignment 48
I/O definition 49
Video iris output description 52

Camera trigger 53
Camera I/O opto-isolated user circuit example 53
Camera I/O non-isolated user circuit example 54
Trigger timing diagram 55
Firmware update 57
Resolution and ROI frame rates 58
Prosilica GC650 58
Prosilica GC655 59
Prosilica GC660 59
Prosilica GC750 60
Prosilica GC780 60
Prosilica GC1020 61
Prosilica GC1280 61
Prosilica GC1290 62
Prosilica GC1350 62
Prosilica GC1380 63
Prosilica GC1380H 63
Prosilica GC1600 64
Prosilica GC1600H 64
Prosilica GC2450 65
Prosilica GC model comparison 66
Appendix 67
Sensor position of Prosilica GC cameras 67
Additional references 68
Index 69

Contacting Allied Vision Technologies

Info

- **Technical information:**
  http://www.alliedvisiontec.com
- **Support:**
  support@alliedvisiontec.com

Allied Vision Technologies GmbH (Headquarters)
Taschenweg 2a
07646 Stadtroda, Germany
Tel: +49 36428-677-0
Fax: +49 36428-677-28
e-mail: info@alliedvisiontec.com

Allied Vision Technologies Canada Inc.
101-3750 North Fraser Way
Burnaby, BC, V5J 5E9, Canada
Tel: +1 604-875-8855
Fax: +1 604-875-8856
e-mail: info@alliedvisiontec.com

Allied Vision Technologies Inc.
38 Washington Street
Newburyport, MA 01950, USA
Toll Free number +1 877-USA-1394
Tel: +1 978-225-2030
Fax: +1 978-225-2029
e-mail: info@alliedvisiontec.com

Allied Vision Technologies Asia Pte. Ltd.
82 Playfair Road
#07-02 D'Lithium, Singapore 368001
Tel: +65 6634-9027
Fax: +65 6634-9029
e-mail: info@alliedvisiontec.com

Allied Vision Technologies (Shanghai) Co. Ltd.
2-2109 Hongwell International Plaza
1602# ZhongShanXi Road, Shanghai 200235, China
Tel: +86 21-64861133
Fax: +86 21-54233670
e-mail: info@alliedvisiontec.com

Introduction

This **AVT Prosilica GC Technical Manual** describes in depth the technical specifications of the Prosilica GC camera family including dimensions, feature overview, I/O definition, trigger timing waveforms, and frame rate performance.

For information on software installation read the **AVT GigE Installation Manual.** For detailed information on camera features and controls specific to the Prosilica GC refer to the **AVT GigE Camera and Driver Features** and **AVT GigE Camera and Driver Attributes** documents.

www

AVT Prosilica GC literature:
http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-gc.html

Document history

Version	Date	Remarks
V2.0.0	2011-Jul-22	New Manual - RELEASE status
V2.0.1	2011-Oct-07	Added note to Figure 34
V.2.0.2	2012-Sep-21	• Renamed Camera IO signals • Reworked cleaning optics section
V.2.0.3	2013-Jan-14	• Updated the **Exposure control** values • Updated the Frame rate vs. Height graphs • Removed the internal I/O circuit diagram
V2.0.4	2013-Mar-26	• Added **Status LEDs** section • Added **Appendix** • Updated the RoHS directive • Updated the pixel format naming according to the GenICam naming convention • Added caution regarding the drive voltage for the video iris lens on page 52 • Added frame rate formulas in the *Resolution and ROI frame rates* chapter
V2.0.5	2013-May-07	• Updated the exposure control values in the *Specifications* chapter • Added VIMBA SDK link in the *Additional references* section • Updated AVT recommended cabling to Category 6 or higher in the *Gigabit Ethernet port* section

Table 1: Document history

Version	Date	Remarks
V2.0.6	2013-Jul-05	• Added contact information for Allied Vision Technologies (Shanghai) Co. Ltd. • Updated the links to **AVT GigE Installation Manual** • Added links to **AVT GigE Camera and Driver Features** document

Table 1: Document history

Conventions used in this manual

To give this manual an easily understood layout and to emphasize important information, the following typographical styles and symbols are used:

Styles

Style	Function	Example
Bold	Programs, inputs, or highlighting important information	**bold**
Courier	Code listings etc.	Input
Upper case	Register	REGISTER
Italics	Modes, fields	*Mode*
Parentheses and/or blue	Links	(Link)

Table 2: Styles

Symbols

Note This symbol highlights important information.

Caution This symbol highlights important instructions. You have to follow these instructions to avoid malfunctions.

www

This symbol highlights URLs for further information. The URL itself is shown in blue.

Example:

http://www.alliedvisiontec.com

Precautions

Caution

Do not disassemble the camera housing. Warranty is void if camera has been disassembled.

This camera contains sensitive internal components.

Caution

Keep shipping material.

Poor packaging of the product may cause damage during shipping.

Caution

Verify all external connections.

Verify all external connections in terms of voltage levels, power requirements, voltage polarity, and signal integrity prior to powering the device.

Caution

Cleaning.

This product can be damaged by some volatile cleaning agents. Avoid cleaning the image sensor unless absolutely necessary. Please see instructions on optics cleaning in this document.

Caution

Do not exceed environmental specifications.

See environmental specifications limits in the Specifications section of this document. Special care must be taken to maintain a reasonable operating temperature. If the camera is operated in temperatures higher than the specified range, the camera should be mounted on a heat sink.

Cleaning optics

Caution **Do not touch any optics with fingers. Oil from fingers can damage fragile optical coatings.**

Identifying debris

Debris on the image sensor or optical components appears as a darkened area or smudge on a camera image. Do not confuse this with a pixel defect which appears as a distinct point.

Locating debris

First determine whether the debris is on the sensor glass, IR filter (if used), or lens. The farther away the debris is from the sensor, the blurrier the debris appears on a camera image.

Stream a live image from the camera using a uniform target, such as a piece of paper. To determine if the debris is on the camera lens, rotate the lens independent of the camera. If the spot moves, the debris is on the lens. Otherwise, the debris is on the IR filter (if used) or sensor glass.

Color cameras with IR filter

Prosilica GC color cameras are equipped with an IR filter. With no lens or lens cap on a camera, the IR filter is exposed and debris can accumulate on it. This is the most probable location for debris. It should not be necessary to remove the IR filter for cleaning. Clean the outside of the IR filter glass using the techniques explained in the next section.

If it is determined that the debris is on the inside surface of the filter glass, or the sensor glass, IR filter removal is necessary. Depending on the manufacturing date of your Prosilica GC camera, the IR filter may be slot type, or pinhole type. Slot type filters can be removed using a small flat head screw driver. Pinhole type filters require a pin spanner wrench for removal.

Note A pin spanner wrench suitable for IR filter removal is available for purchase from AVT.
AVT P/N: E9020001

Cleaning with air

Blow directly on the contaminated surface with moderate pressure, clean compressed air.

Caution

Do not exceed 90 psi. If using canned air (typically ~ 70 psi when full), do not shake or tilt the can, as extreme changes in temperature due to sudden cold air can crack the optic glass.

View a live image with the camera after blowing. If debris is still present, repeat the process until it is determined that the particulate cannot be dislodged. If this is the case, proceed to the contact cleaning technique.

Contact cleaning

Only use this method if the above air cleaning method does not sufficiently clean the surface. Use 99% pure isopropyl alcohol and clean cotton swabs. Wet the swab in the alcohol. Quickly wipe the optics in a single stroke. Prolonged exposure of alcohol on the swab can cause the swab glue to loosen and transfer to the optic glass. Do not reuse the same swab. Repeat this process until the debris is removed. If this process fails to remove the debris, contact AVT.

Conformity

Allied Vision Technologies declares under its sole responsibility that all standard cameras of the **AVT Prosilica GC** family to which this declaration relates are in conformity with the following standard(s) or other normative document(s):

- CE, following the provisions of 2004/108/EG directive
- FCC Part 15 Class A
- RoHS (2011/65/EU)

CE

We declare, under our sole responsibility, that the previously described **AVT Prosilica GC** cameras conform to the directives of the CE.

FC

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Any modifications not expressly approved in this manual may void your authority to operate this equipment.

Specifications
Prosilica GC650/650C

Feature	Specification
Resolution	659 x 493
Sensor	Sony ICX424AL, ICX424AQ for color
Type	CCD Progressive
Sensor size	Type 1/3
Cell size	7.4 µm
Lens mount	C (adjustable) / CS
Max frame rate at full resolution	90 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC650: Mono8, Mono12, Mono12Packed GC650C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 116.8 s; 1 µs increments
Gain control	0 to 19 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to full resolution
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3.3 W @ 12 V DC
Trigger latency	1.0 µs for non-isolated I/O, 2.8 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	104 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 3: Prosilica GC650/650C camera specifications

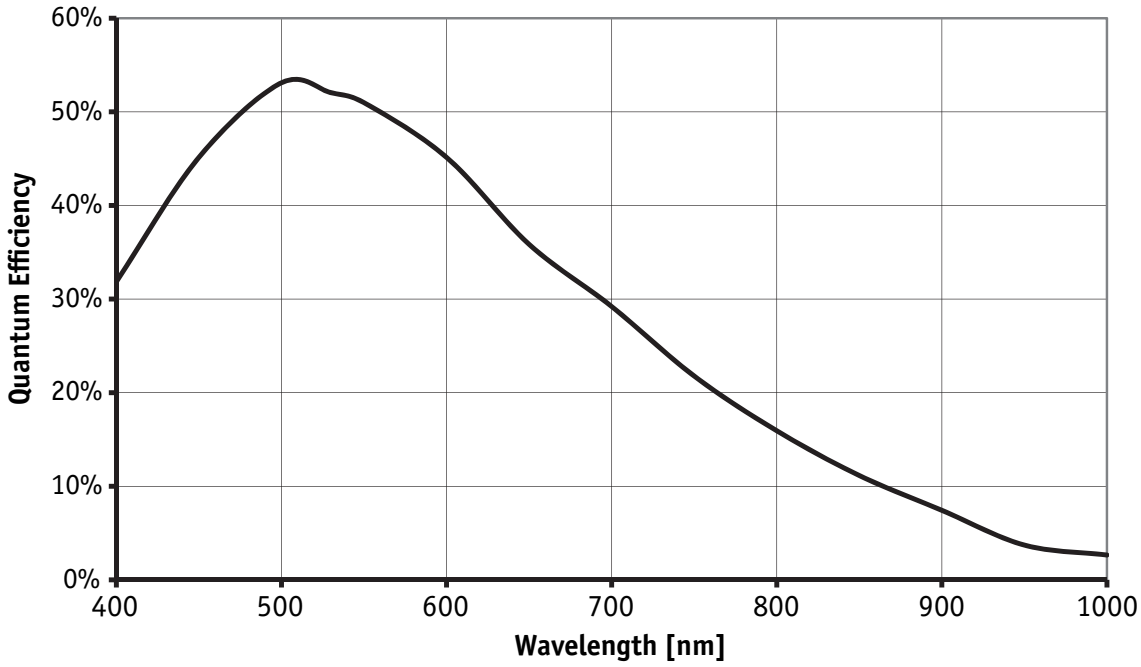


Figure 1: Prosilica GC650 monochrome spectral response

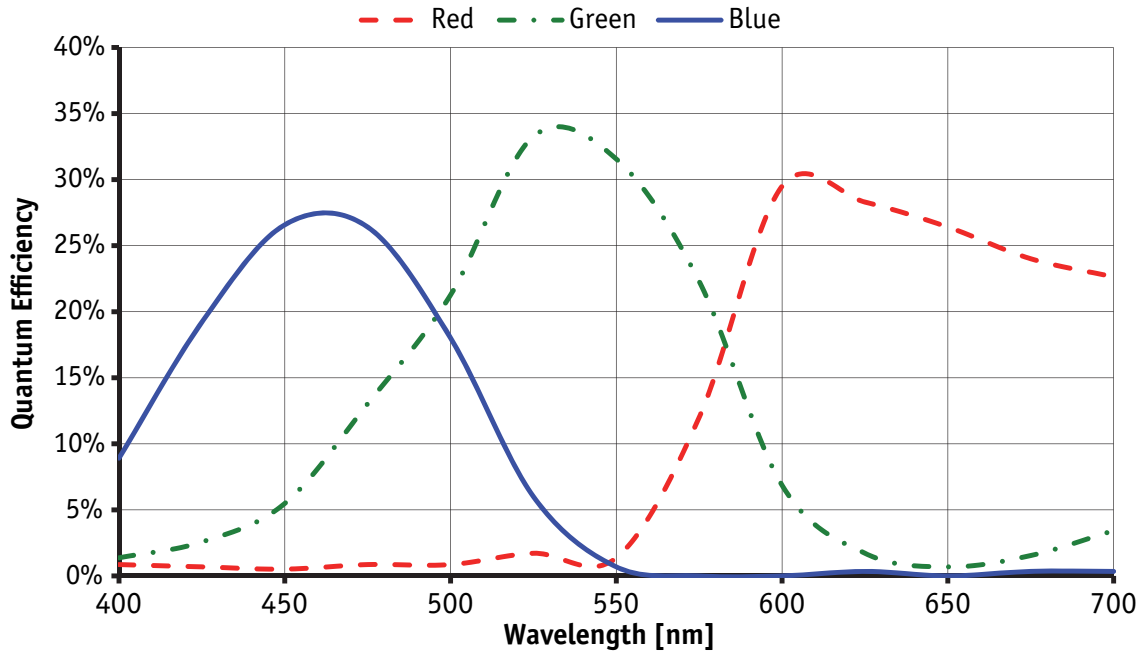


Figure 2: Prosilica GC650C color spectral response

Prosilica GC655/655C

Feature	Specification
Resolution	659 x 493
Sensor	Sony ICX414AL, ICX414AQ for color
Type	CCD Progressive
Sensor size	Type 1/2
Cell size	9.9 µm
Lens mount	C (adjustable) / CS
Max frame rate at full resolution	119 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC655: Mono8, Mono12, Mono12Packed GC655C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 116.8 s; 1 µs increments
Gain control	0 to 22 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to full resolution
TTL I/Os	1 input, 1 outputs
Opto-coupled I/Os	1 input, 1 outputs
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3.0 W @ 12 VDC
Trigger latency	1.0 µs for non-isolated I/O, 2.8 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	105 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 4: Prosilica GC655/655C camera specifications

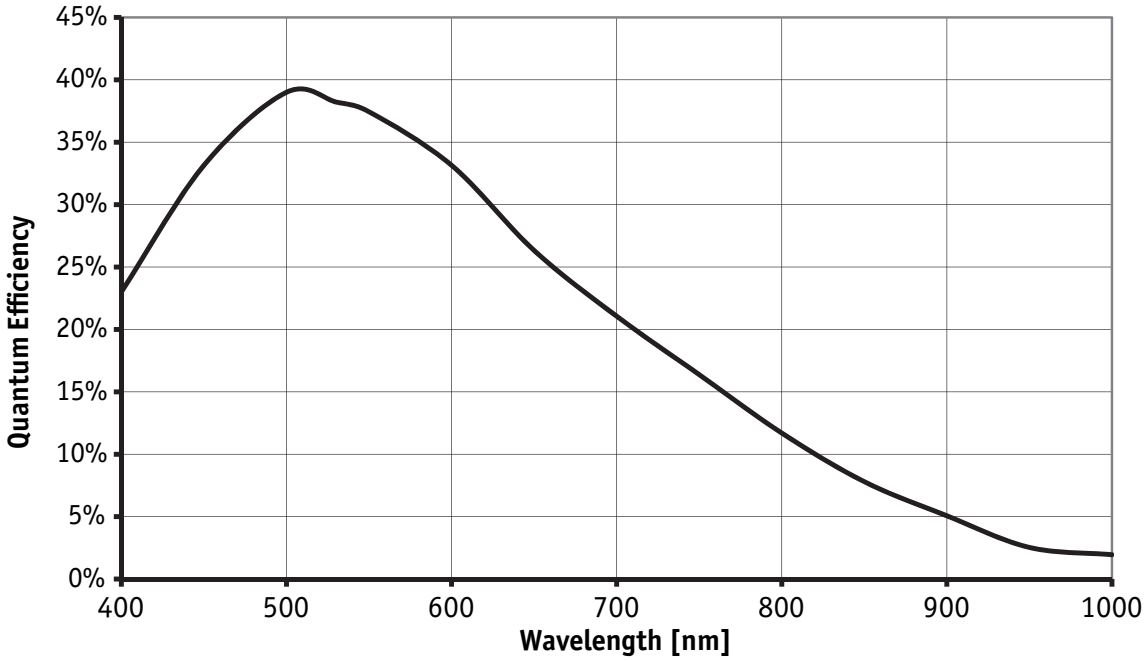


Figure 3: Prosilica GC655 monochrome spectral response

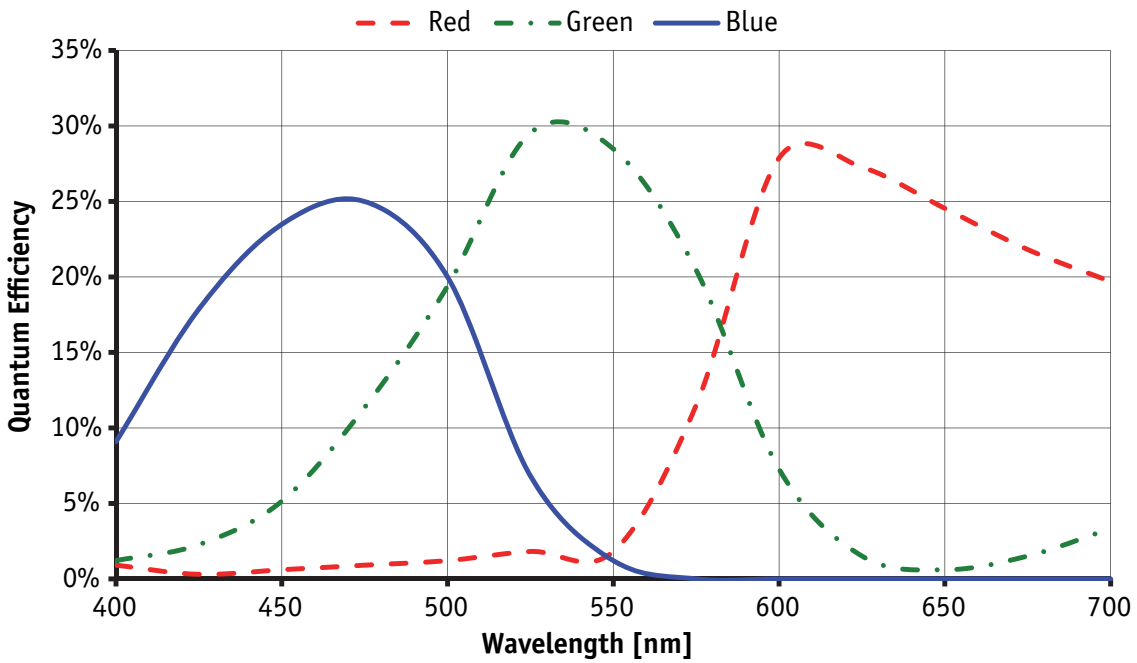


Figure 4: Prosilica GC655C color spectral response

Prosilica GC660/660C

Feature	Specification
Resolution	659 x 493
Sensor	Sony ICX618ALA, ICX618AQ for color
Type	CCD Progressive
Sensor size	Type 1/4
Cell size	5.6 µm
Lens mount	C (adjustable) / CS
Max frame rate at full resolution	119 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC660: Mono8, Mono12, Mono12Packed GC660C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 78.5 s; 1 µs increments
Gain control	0 to 34 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 16 rows
TTL I/Os	1 input, 1 outputs
Opto-coupled I/Os	1 input, 1 outputs
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3.0 W @ 12 VDC
Trigger latency	1.0 µs for non-isolated I/O, 2.8 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	105 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 5: Prosilica GC660/660C camera specifications

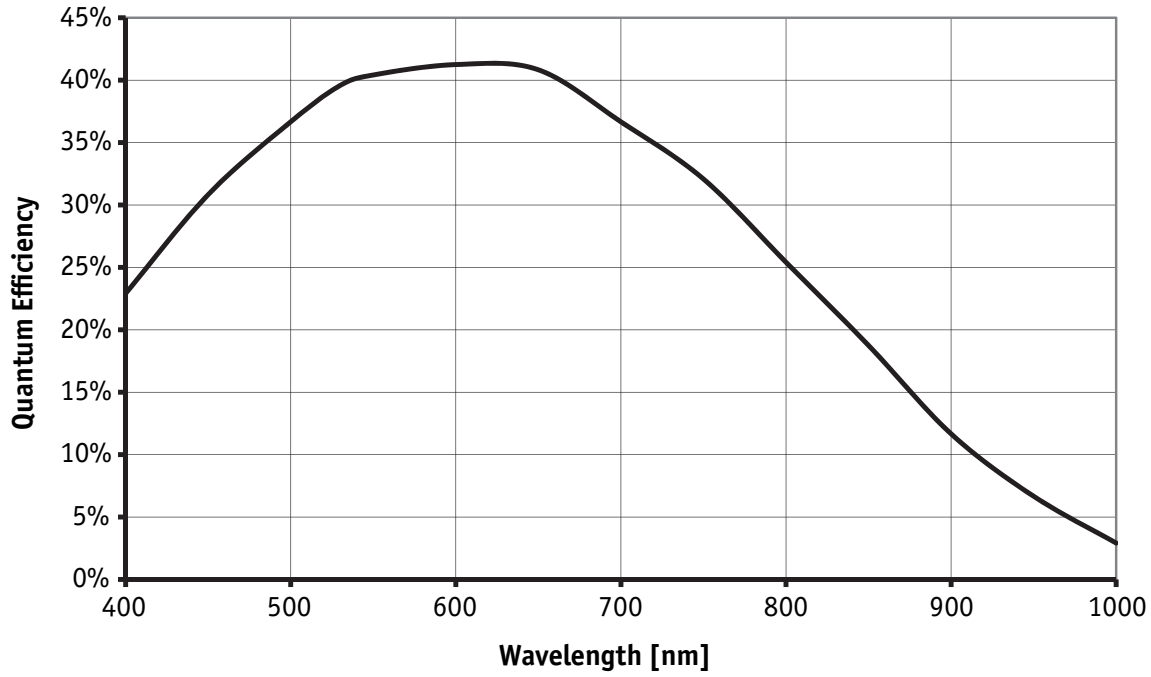


Figure 5: Prosilica GC660 monochrome spectral response

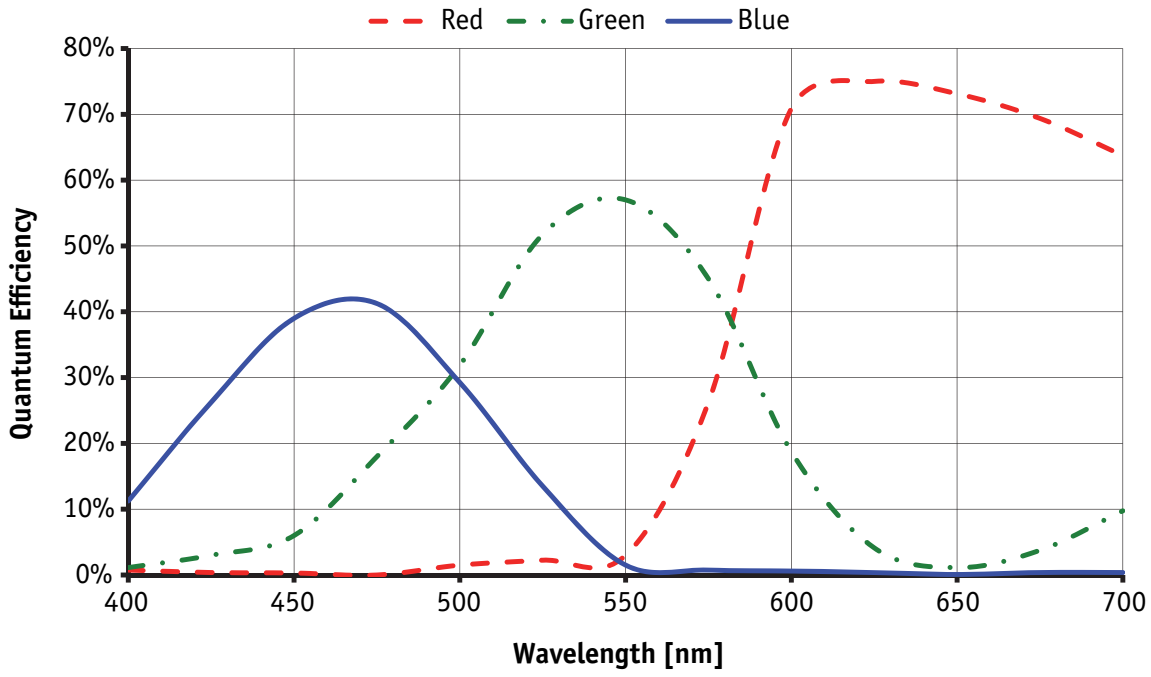


Figure 6: Prosilica GC660C color spectral response

Prosilica GC750/750C

Feature	Specification
Resolution	752 x 480
Sensor	Micron MT9V022
Type	CMOS Progressive
Sensor size	Type 1/3
Cell size	6 µm
Lens mount	CS
Max frame rate at full resolution	67 fps
A/D	10 bit
On-board FIFO	16 MB
Bit depth	8/10
Mono formats	GC750: Mono8, Mono10 GC750C: Mono8
Color formats	BayerBG8, BayerBG10, RGB8Packed, BGR8Packed, RGBA8Packed, BGRA8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	30 µs to 60 s; 1 µs increments
Gain control	0 to 48 dB
TTL I/Os	1 input, 1 outputs
Opto-coupled I/Os	1 input, 1 outputs
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	2.2 W @ 12 VDC
Trigger latency	31 µs for non-isolated I/O, 43 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	45 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	85 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 6: Prosilica GC750/750C camera specifications

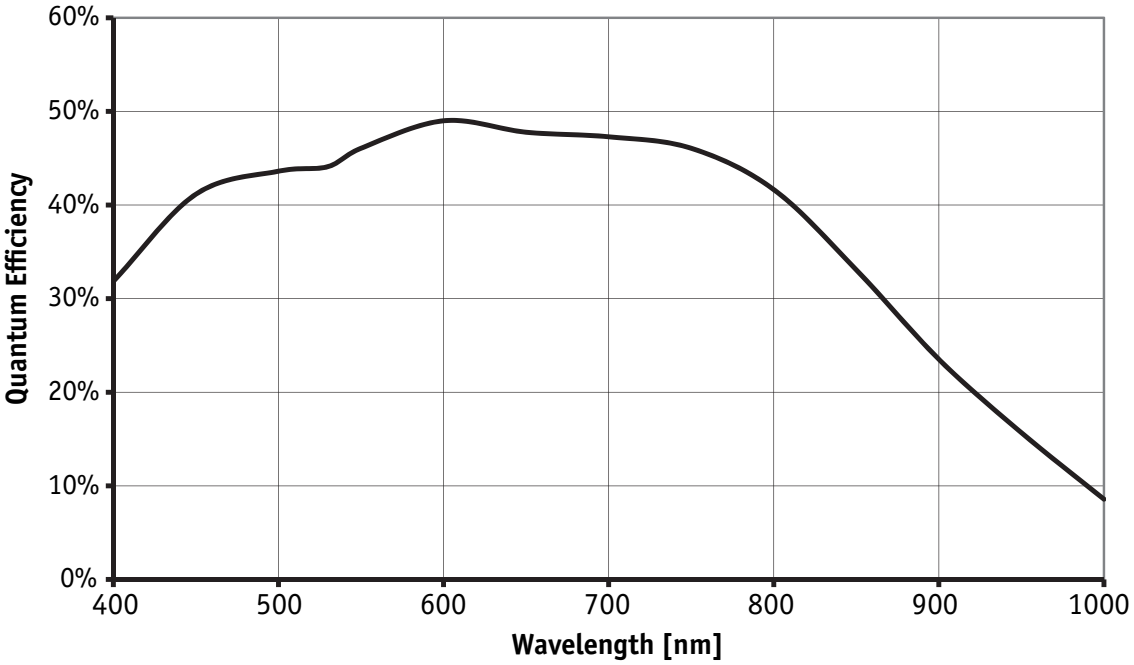


Figure 7: Prosilica GC750 monochrome spectral response

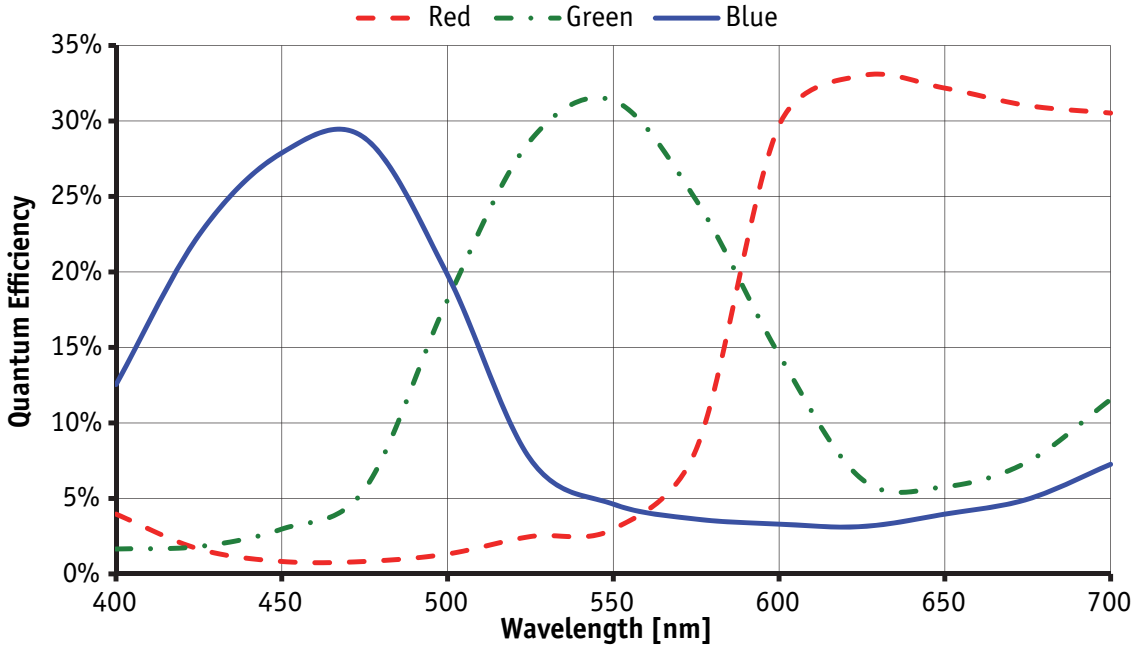


Figure 8: Prosilica GC750C color spectral response

Prosilica GC780/780C

Feature	Specification
Resolution	782 x 582
Sensor	Sony ICX415AL, ICX415AQ for color
Type	CCD Progressive
Sensor size	Type 1/2
Cell size	8.3 µm
Lens mount	C (adjustable)
Max frame rate at full resolution	64 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC780: Mono8, Mono12, Mono12Packed GC780C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	8 µs to 116.8 s; 1 µs increments
Horizontal binning	1 to 8 pixels
Vertical binning	1 to full resolution
Gain control	GC780: 0 to 26 dB GC780C: 0 to 23 dB
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	2.8 W @ 12 VDC
Trigger latency	1 µs for non-isolated I/O, 2.8 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	100 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 7: Prosilica GC780/780C camera specifications

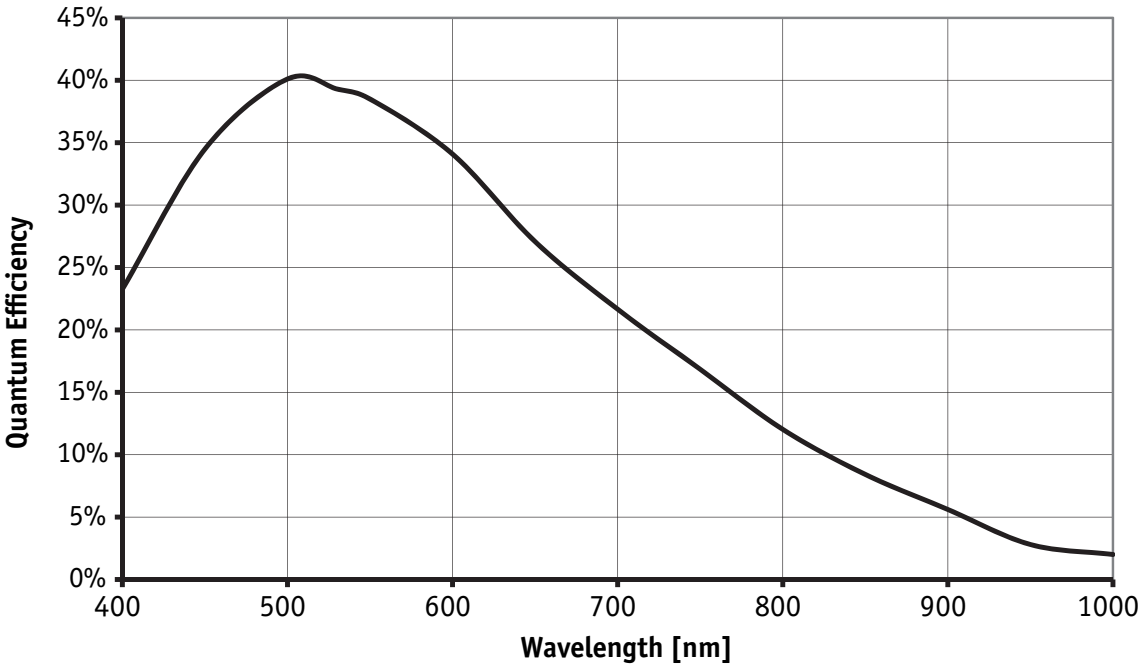


Figure 9: Prosilica GC780 monochrome spectral response

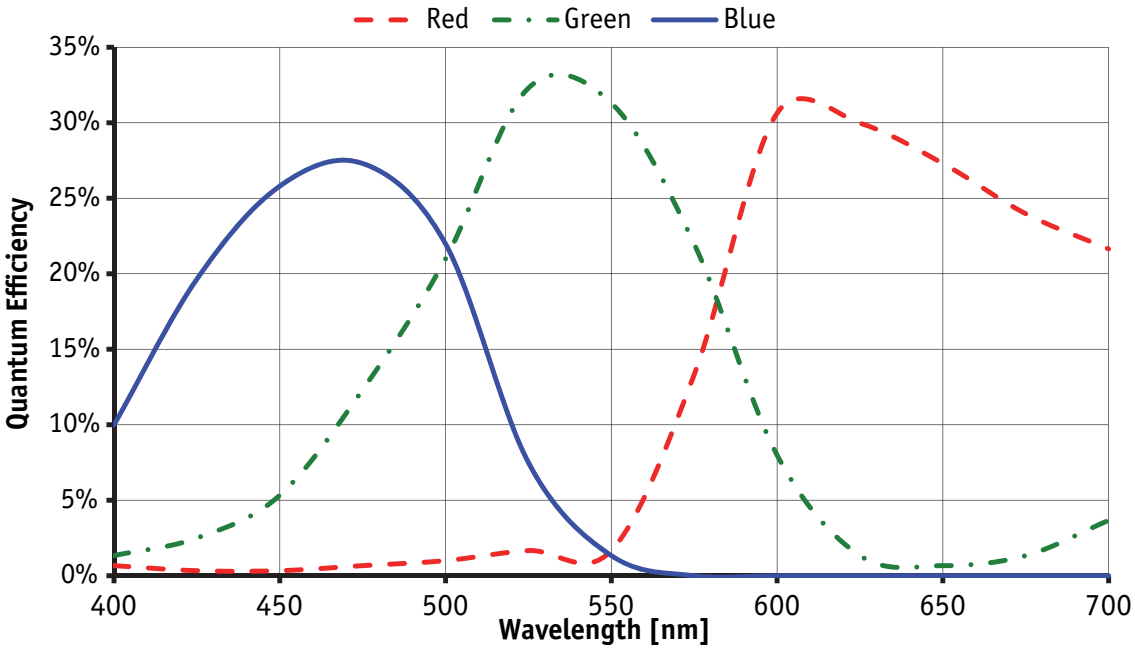


Figure 10: Prosilica GC780C color spectral response

Prosilica GC1020/1020C

Feature	Specification
Resolution	1024 x 768
Sensor	Sony ICX204AL, ICX204AK for color
Type	CCD Progressive
Sensor size	Type 1/3
Cell size	4.65 µm
Lens mount	C (adjustable) / CS
Max frame rate at full resolution	33 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC1020: Mono8, Mono12, Mono12Packed GC1020C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 116.8 s; 1 µs increments
Gain control	0 to 22 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to full resolution
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	2.9 W @ 12 VDC
Trigger latency	2.8 µs for non-isolated I/O, 4.5 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	99 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 8: Prosilica GC1020/1020C camera specifications

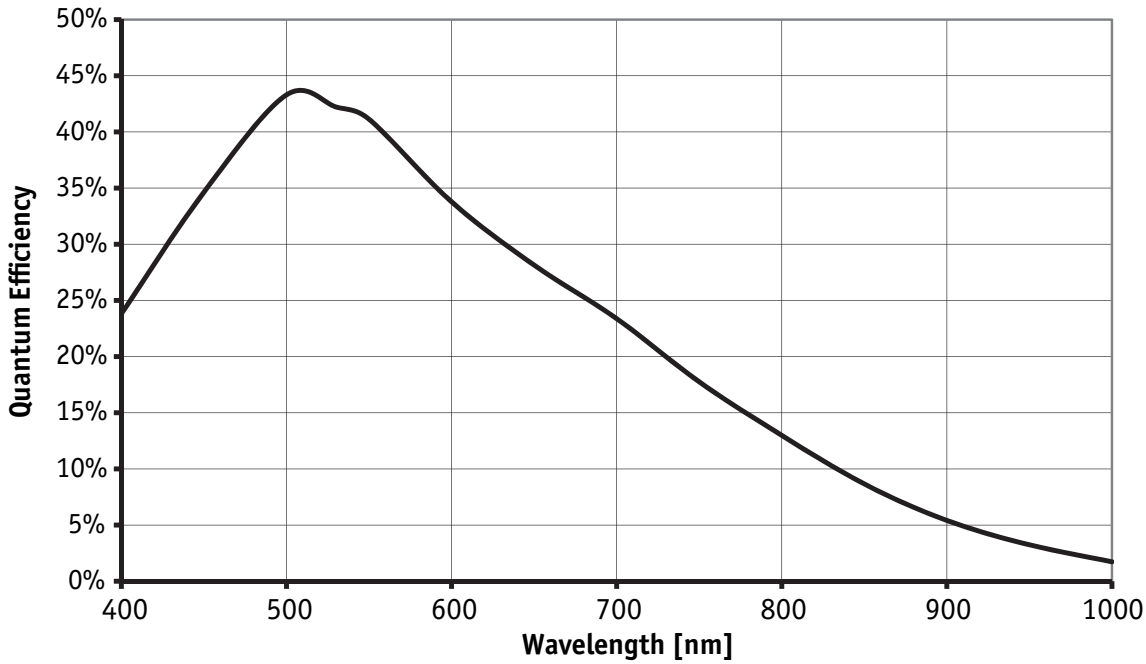


Figure 11: Prosilica GC1020 monochrome spectral response

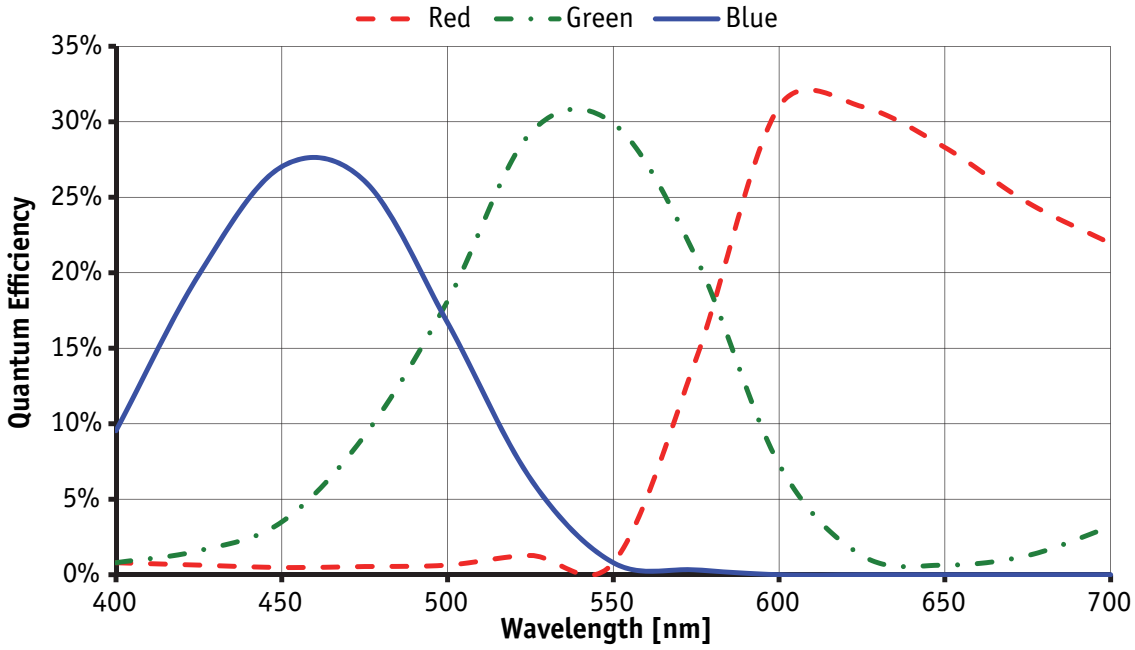


Figure 12: Prosilica GC1020C color spectral response

Prosilica GC1280

Feature	Specification
Resolution	1280 x 1024
Sensor	Cypress IBIS5B
Type	CMOS Progressive
Sensor size	Type 2/3
Cell size	6.7 µm
Lens mount	C (adjustable)
Max frame rate at full resolution	27 fps
A/D	10 bit
On-board FIFO	16 MB
Bit depth	8/10
Mono formats	Mono8
Exposure control	10 µs to 1 s; 1 µs increments
Gain control	0 to 15 dB
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	2.9 W @ 12 VDC
Trigger latency	2.8 µs for non-isolated I/O, 4.5 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	99 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 9: Prosilica GC1280 camera specifications

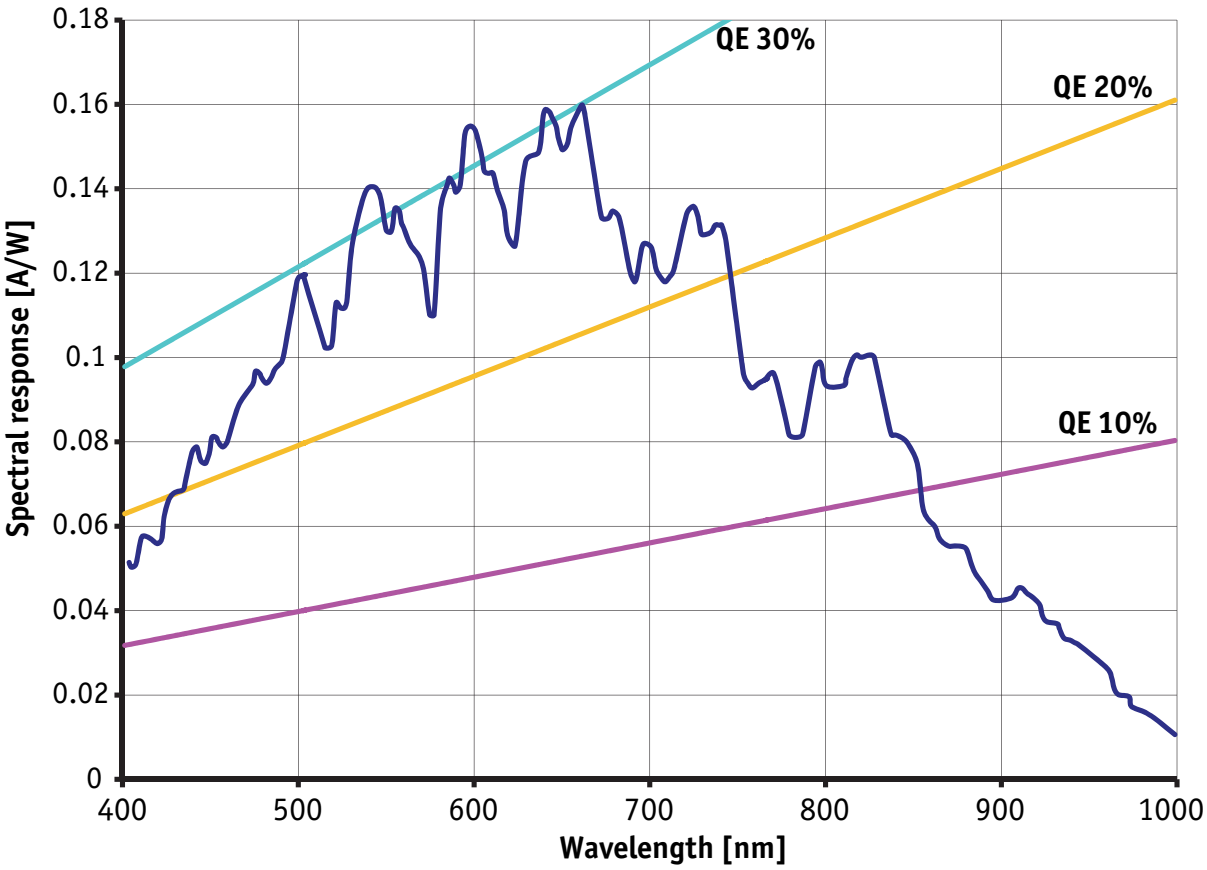


Figure 13: Prosilica GC1280 monochrome spectral response

Prosilica GC1290/1290C

Feature	Specification
Resolution	1280 x 960
Sensor	Sony ICX445ALA, ICX445AQA for color
Type	CCD Progressive
Sensor size	Type 1/3
Cell size	3.75 µm
Lens mount	C (adjustable) / CS
Max frame rate at full resolution	32 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC1290: Mono8, Mono12, Mono12Packed GC1290C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	12 µs to 78.5 s; 1 µs increments
Gain control	0 to 24 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 16 rows
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3 W @ 12 VDC
Trigger latency	2 µs for non-isolated I/O, 10 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	106 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 10: Prosilica GC1290/1290C camera specifications

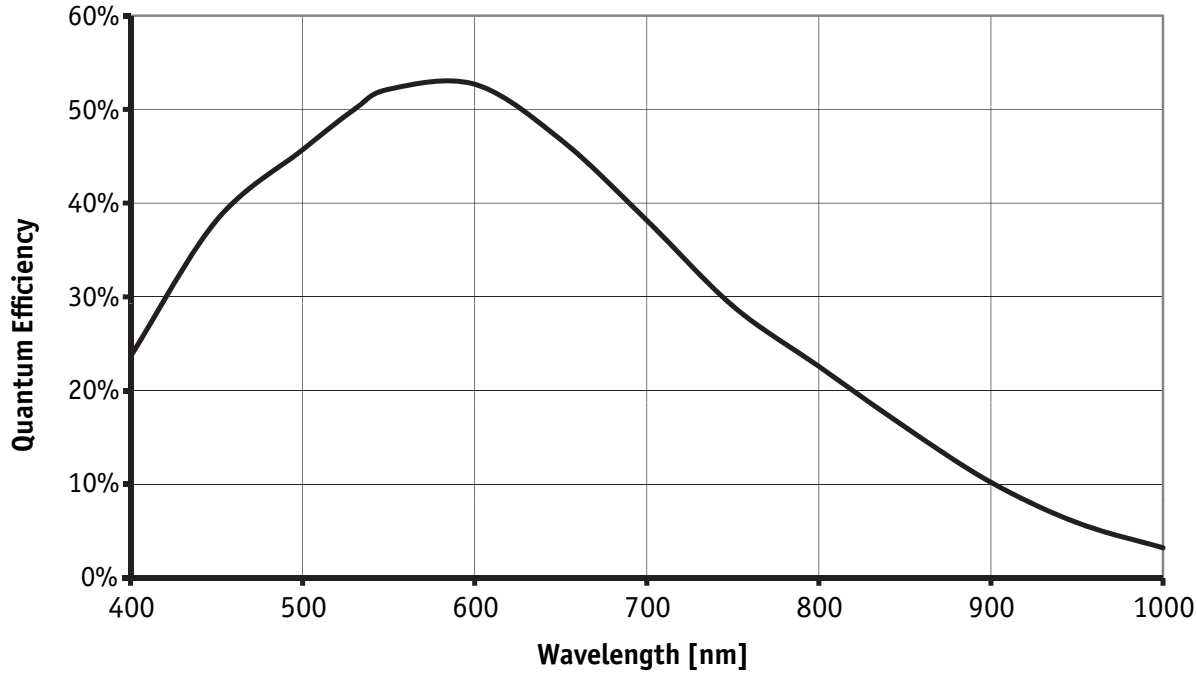


Figure 14: Prosilica GC1290 monochrome spectral response

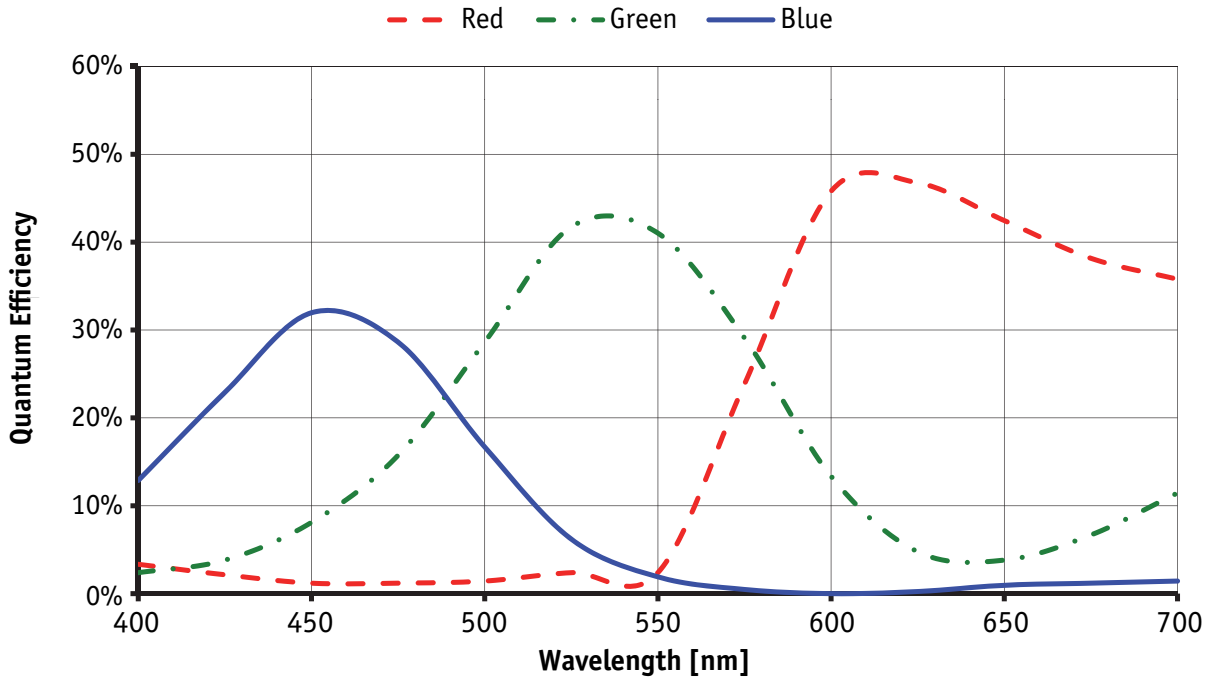


Figure 15: Prosilica GC1290C color spectral response

Prosilica GC1350/1350C

Feature	Specification
Resolution	1360 x 1024
Sensor	Sony ICX205AL, Sony ICX205AK for color
Type	CCD Progressive
Sensor size	Type 1/2
Cell size	4.65 µm
Lens mount	C (adjustable) / CS
Max frame rate at full resolution	20 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC1350: Mono8, Mono12, Mono12Packed GC1350C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	12 µs to 116.8 s; 1 µs increments
Gain control	0 to 25 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 16 rows
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3 W @ 12 VDC
Trigger latency	3.5 µs for non-isolated I/O, 5 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	100 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 11: Prosilica GC1350/1350C camera specifications

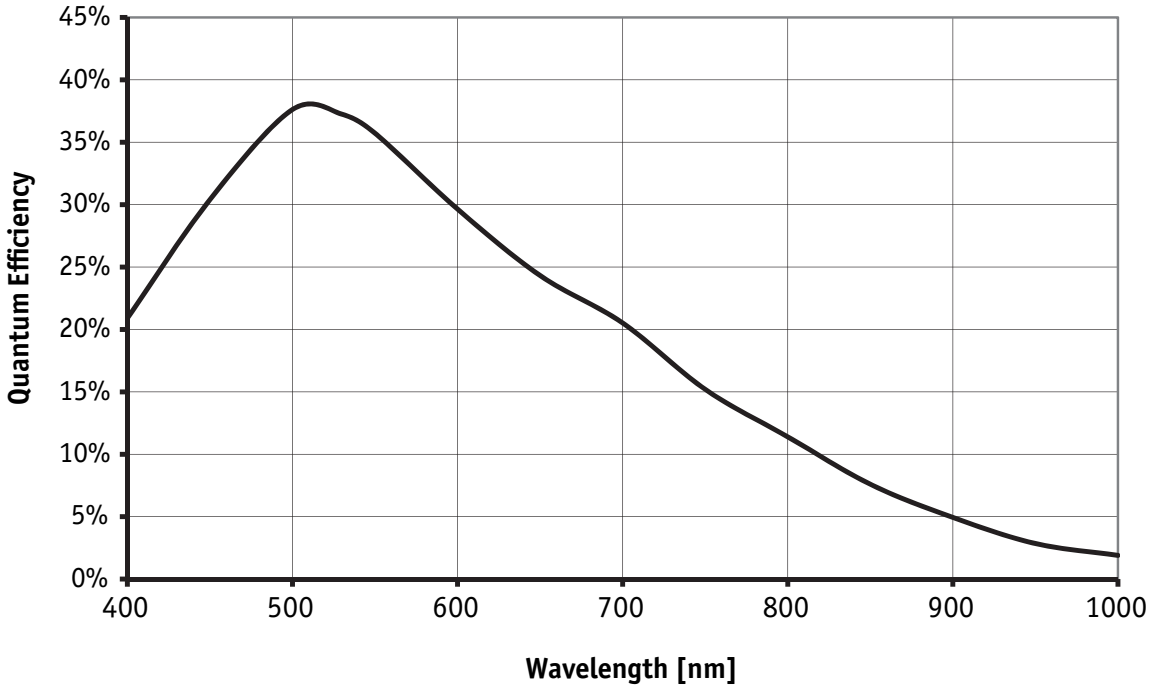


Figure 16: Prosilica GC1350 monochrome spectral response

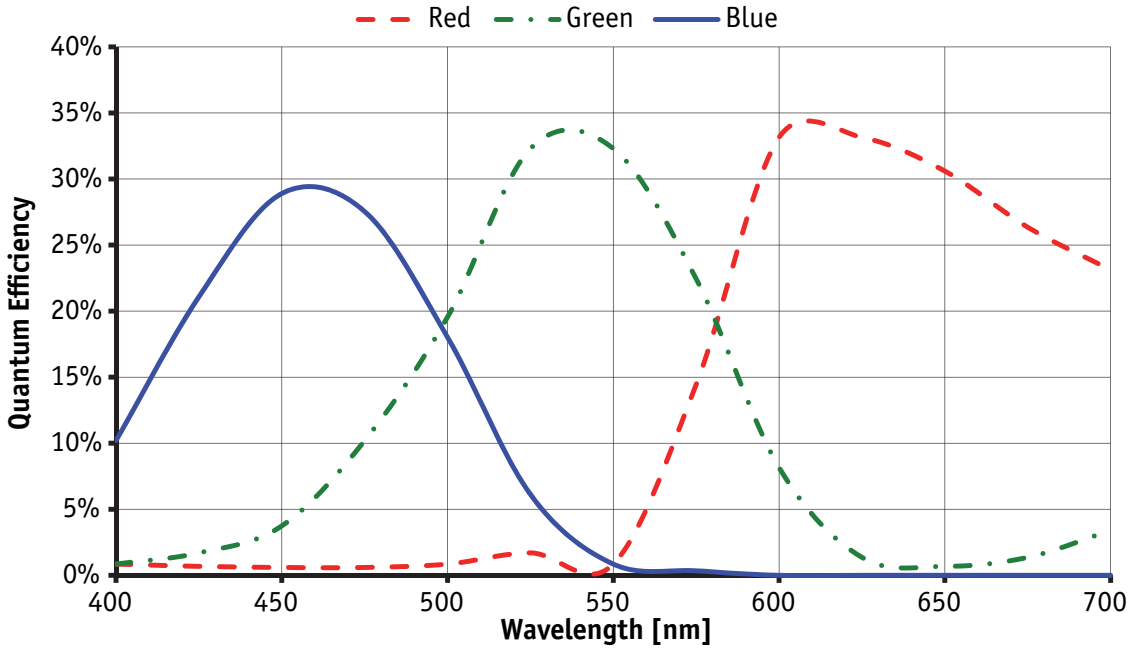


Figure 17: Prosilica GC1350C color spectral response

Prosilica GC1380/1380C

Feature	Specification
Resolution	1360 x 1024
Sensor	Sony ICX285AL, Sony ICX285AQ for color
Type	CCD Progressive
Sensor size	Type 2/3
Cell size	6.45 µm
Lens mount	C (adjustable)
Max frame rate at full resolution	20.2 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC1380: Mono8, Mono12, Mono12Packed GC1380C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 116.8 s; 1 µs increments
Gain control	0 to 27 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to full resolution
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3.3 W @ 12 VDC
Trigger latency	3.7 µs for non-isolated I/O, 5 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	104 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 12: Prosilica GC1380/1380C camera specifications

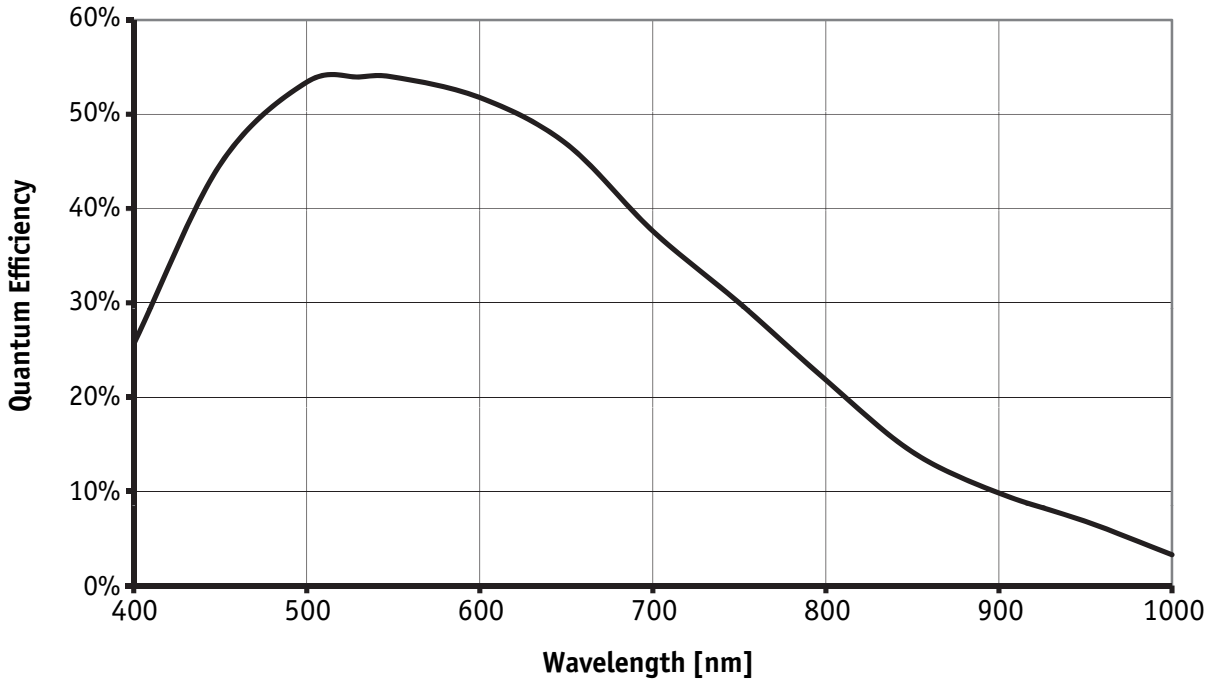


Figure 18: Prosilica GC1380 monochrome spectral response

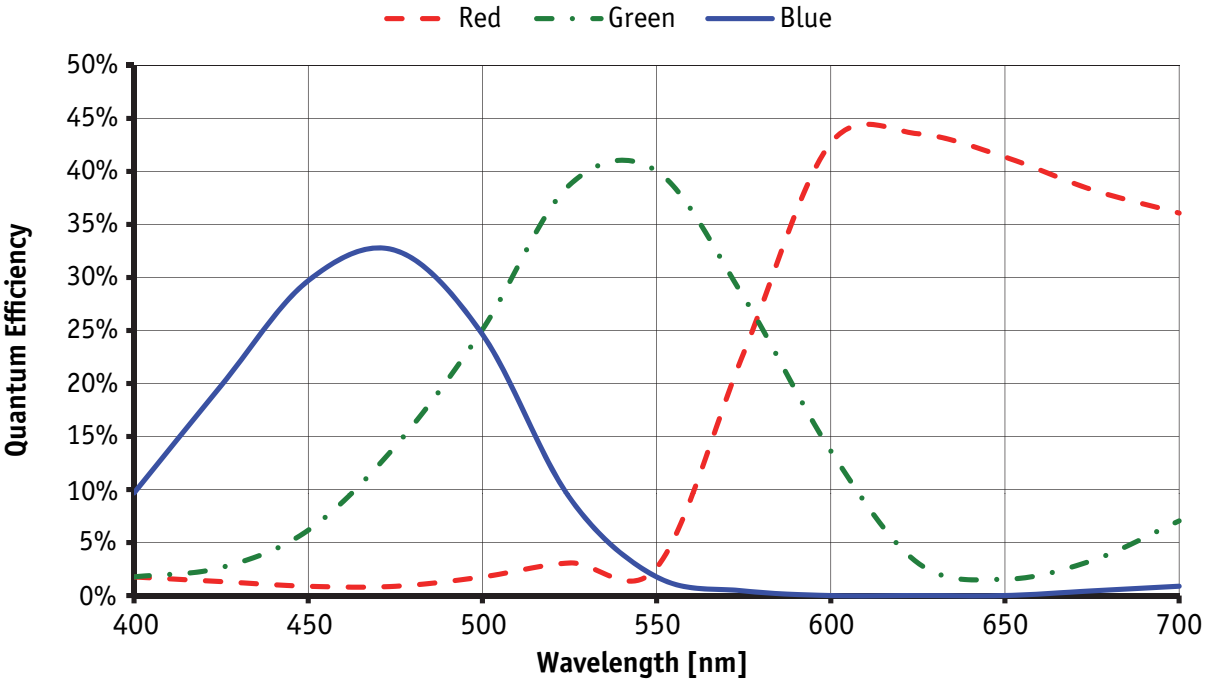


Figure 19: Prosilica GC1380C color spectral response

Prosilica GC1380H/1380CH

Feature	Specification
Resolution	1360 x 1024
Sensor	Sony ICX285AL, Sony ICX285AQ for color
Type	CCD Progressive
Sensor size	Type 2/3
Cell size	6.45 µm
Lens mount	C (adjustable)
Max frame rate at full resolution	30 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC1380H: Mono8, Mono12, Mono12Packed GC1380CH: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 78.5 s; 1 µs increments
Gain control	0 to 33 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to 14 rows
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3.3 W @ 12 VDC
Trigger latency	2 µs for non-isolated I/O, 10 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	111 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 13: Prosilica GC1380H/1380CH camera specifications

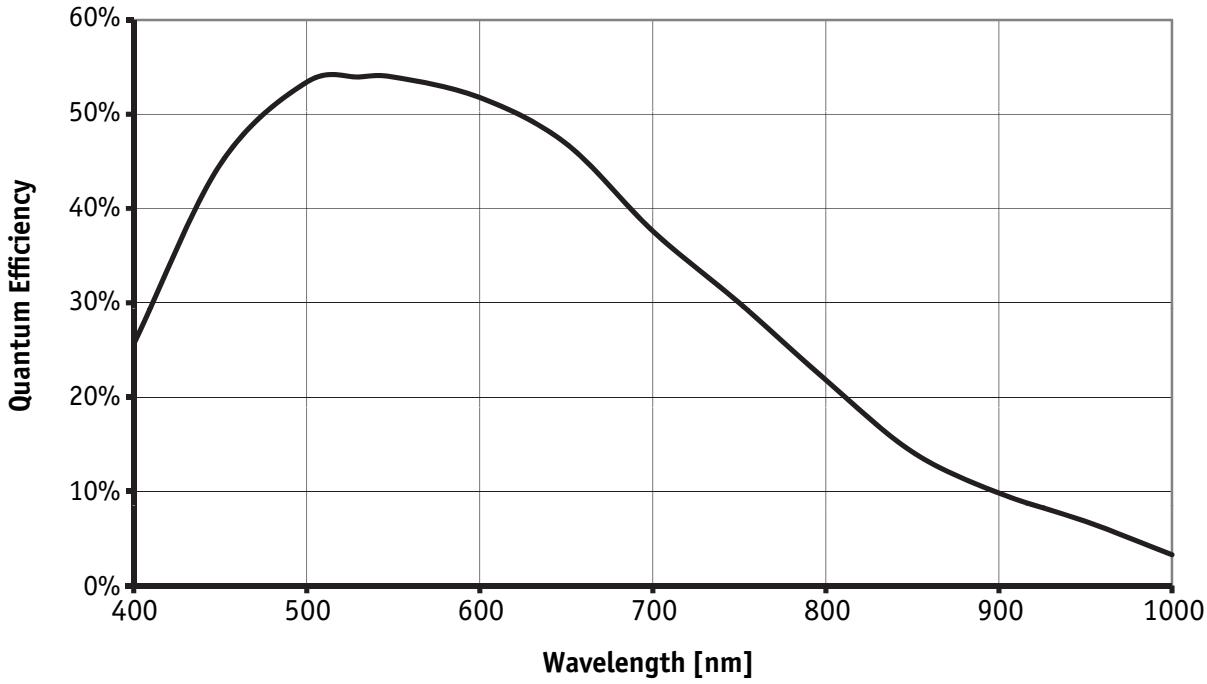


Figure 20: Prosilica GC1380H monochrome spectral response

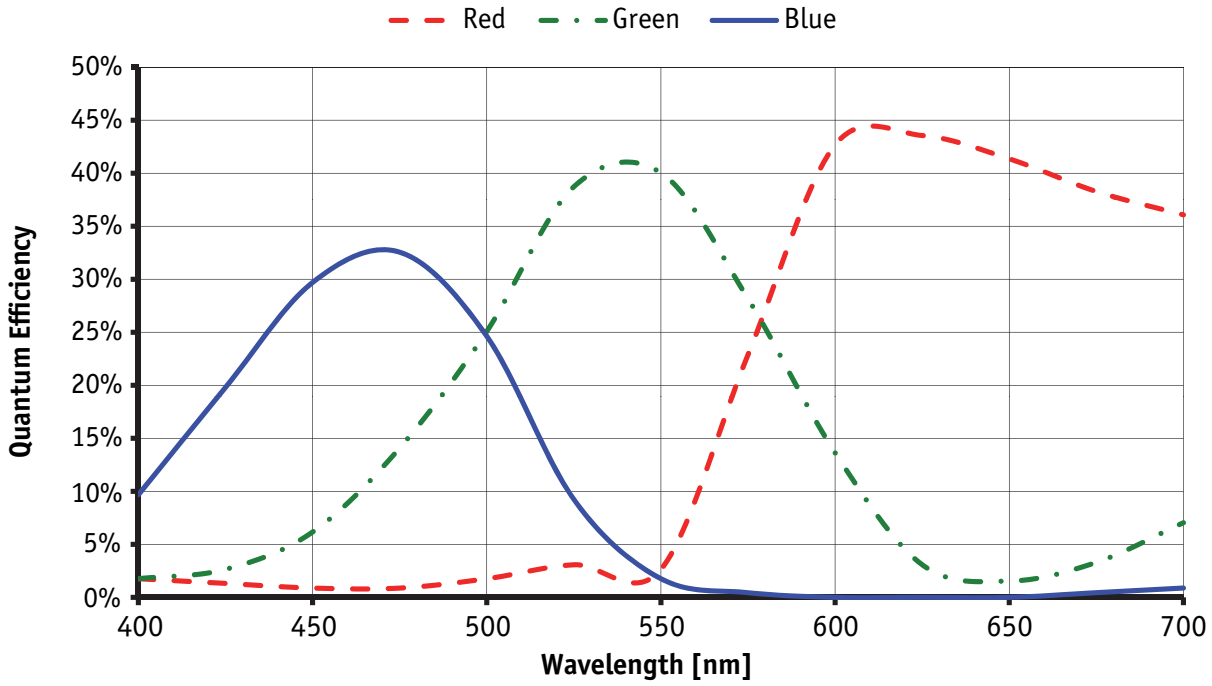


Figure 21: Prosilica GC1380CH color spectral response

Prosilica GC1600/1600C

Feature	Specification
Resolution	1620 x 1220
Sensor	Sony ICX274AL, ICX274AQ for color
Type	CCD Progressive
Sensor size	Type 1/1.8
Cell size	4.4 µm
Lens mount	C (adjustable)
Max frame rate at full resolution	15 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC1600: Mono8, Mono12, Mono12Packed GC1600C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 116.8 s; 1 µs increments
Gain control	0 to 21 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to full resolution
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3.3 W @ 12 VDC
Trigger latency	2.3 µs for non-isolated I/O, 4 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	10 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	97 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 14: Prosilica GC1600/1600C camera specifications

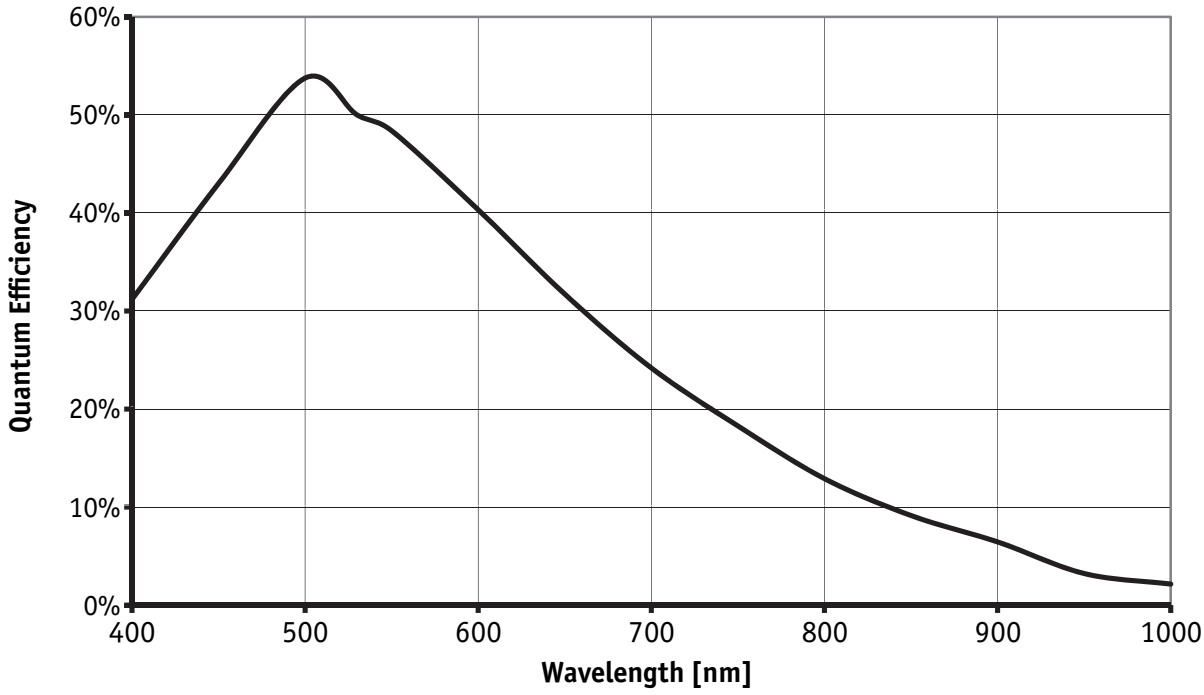


Figure 22: Prosilica GC1600 monochrome spectral response

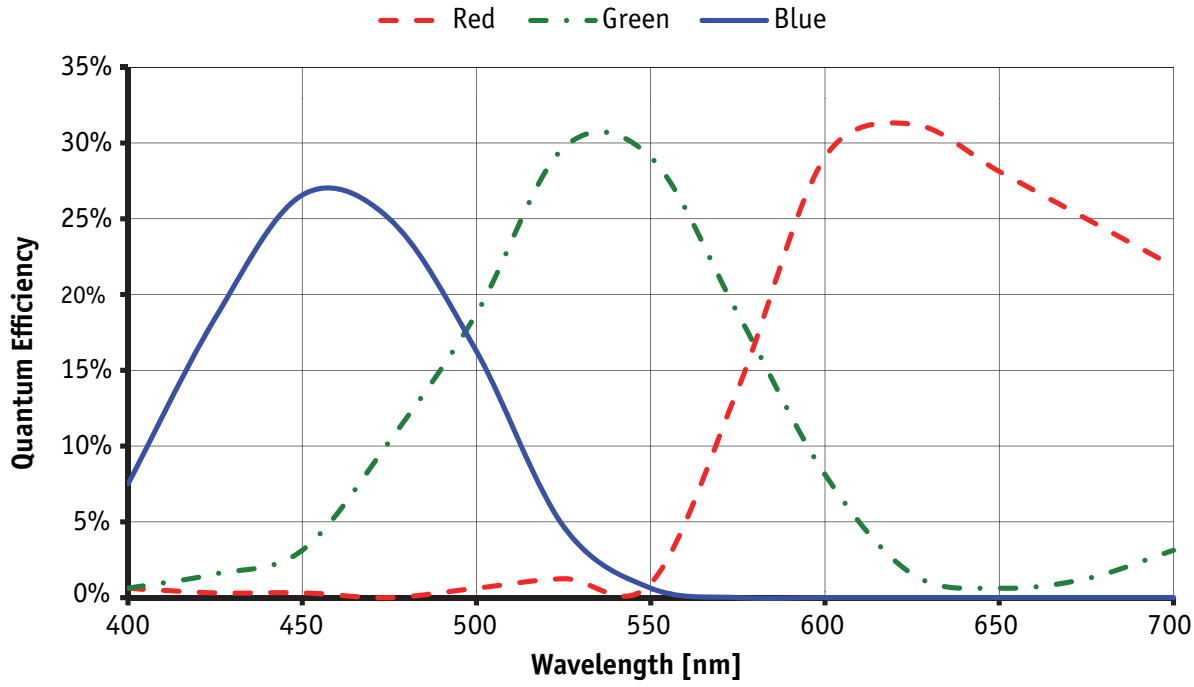


Figure 23: Prosilica GC1600C color spectral response

Prosilica GC1600H/1600CH

Feature	Specification
Resolution	1620 x 1220
Sensor	Sony ICX274AL, ICX274AQ for color
Type	CCD Progressive
Sensor size	Type 1/1.8
Cell size	4.4 µm
Lens mount	C (adjustable)
Max frame rate at full resolution	25 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC1600H: Mono8, Mono12, Mono12Packed GC1600CH: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 68.7 s; 1 µs increments
Gain control	0 to 32 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to full resolution
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3.3 W @ 12 VDC
Trigger latency	2 µs for non-isolated I/O, 10 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	20 ns for non-isolated I/O, 0.5 µs for isolated I/O
Operating temperature	0 to +50 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	105 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 15: Prosilica GC1600H/1600CH camera specifications

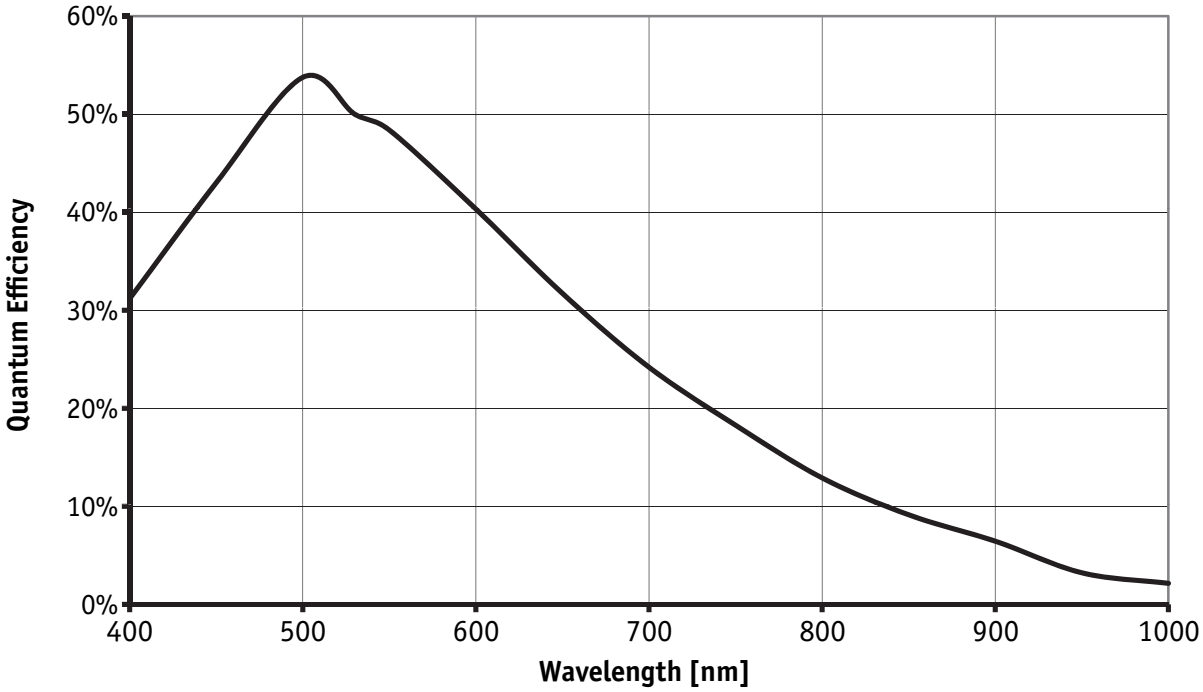


Figure 24: Prosilica GC1600H monochrome spectral response

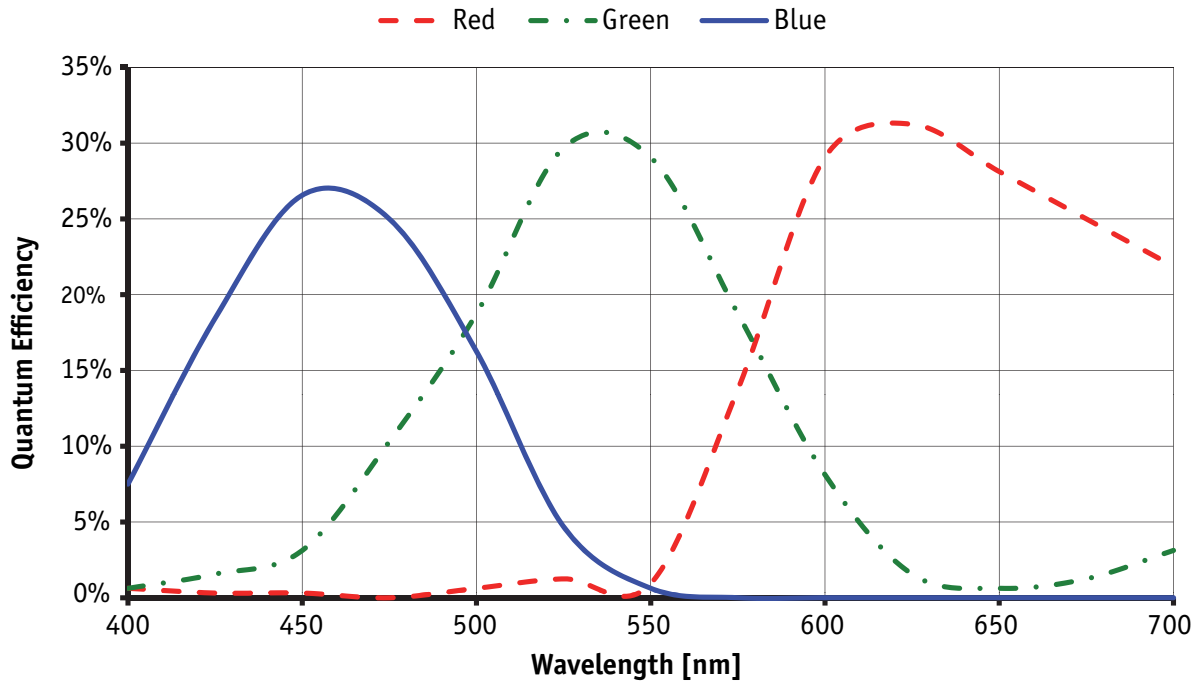


Figure 25: Prosilica GC1600CH color spectral response

Prosilica GC2450/2450C

Feature	Specification
Resolution	2448 x 2050
Sensor	Sony ICX625ALA, Sony ICX625AQA for color
Type	CCD Progressive
Sensor size	Type 2/3
Cell size	3.45 µm
Lens mount	C (adjustable)
Max frame rate at full resolution	15 fps
A/D	12 bit
On-board FIFO	16 MB
Bit depth	8/12
Mono formats	GC2450: Mono8, Mono12, Mono12Packed GC2450C: Mono8
Color formats	BayerRG8, BayerRG12, BayerGR12Packed, RGB8Packed, BGR8Packed, YUV411Packed, YUV422Packed, YUV444Packed
Exposure control	10 µs to 42.9 s; 1 µs increments
Gain control	0 to 32 dB
Horizontal binning	1 to 8 pixels
Vertical binning	1 to full resolution
TTL I/Os	1 input, 1 output
Opto-coupled I/Os	1 input, 1 output
RS-232	1
Power requirements	5–16 VDC: Cameras SN: 02-XXXXX-**0**XXXX 5–25 VDC: Cameras SN: 02-XXXXX-**1**XXXX
Power consumption	3.8 W @ 12 VDC
Trigger latency	2 µs for non-isolated I/O, 10 µs for isolated I/O
Trigger jitter	±20 ns for non-isolated I/O, ±0.5 µs for isolated I/O
Tpd	20 ns for non-isolated I/O, 1.3 µs for isolated I/O
Operating temperature	0 to +40 °C ambient temperature (without condensation)
Storage temperature	-10 to +70 °C ambient temperature (without condensation)
Operating humidity	20 to 80% non-condensing
Body dimensions (L x W x H)	59 x 46 x 33 mm including connectors, w/o tripod and lens
Mass	106 g
Hardware interface standard	IEEE 802.3 1000BASE-T, 100BASE-TX
Software interface standard	GigE Vision Standard 1.2
Regulatory	CE, FCC Class A, RoHS (2011/65/EU)

Table 16: Prosilica GC2450/2450C camera specifications

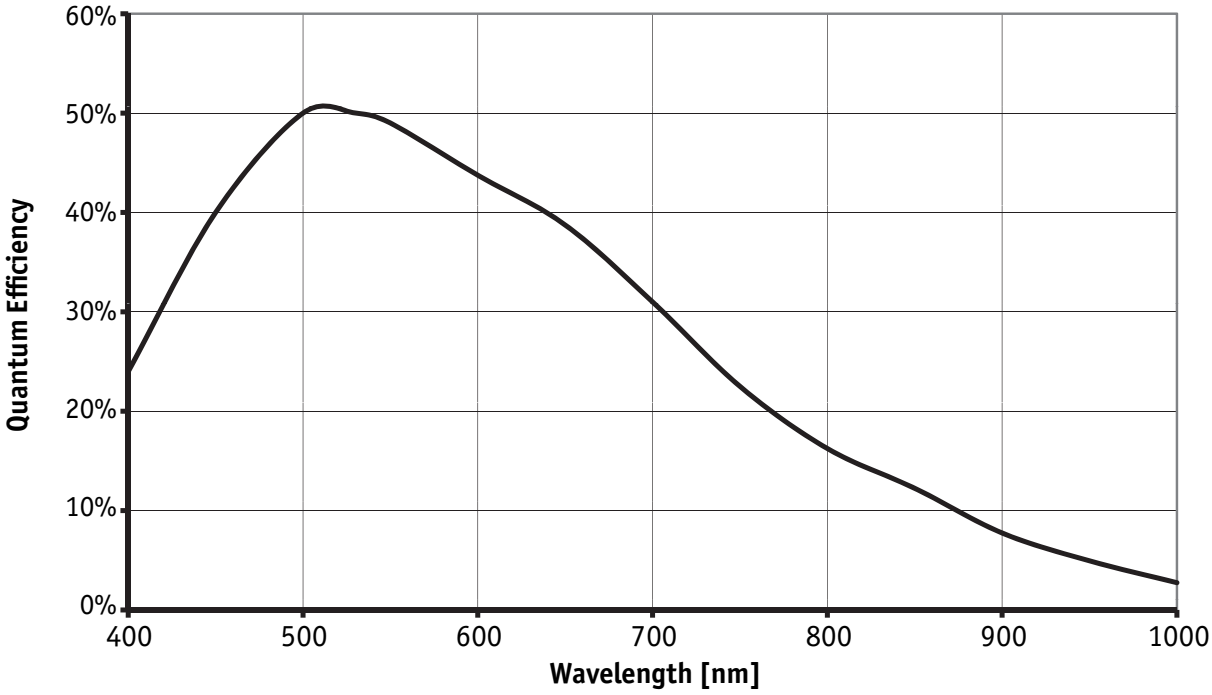


Figure 26: Prosilica GC2450 color spectral response

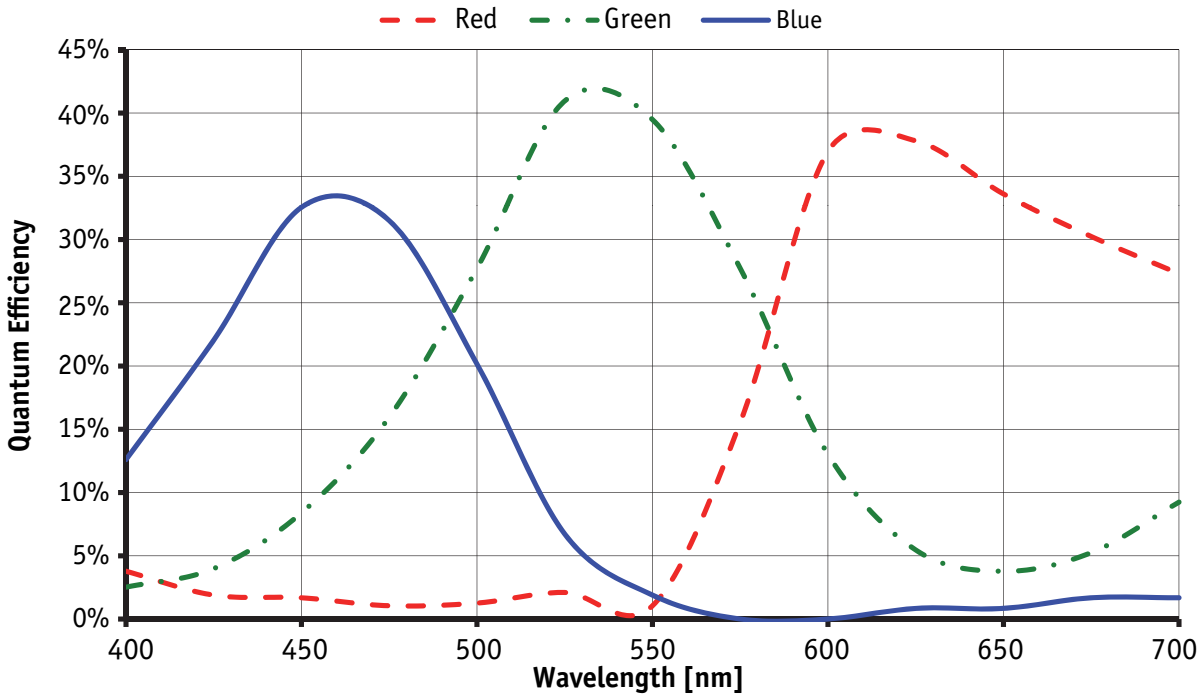


Figure 27: Prosilica GC2450C color spectral response

Camera attribute highlights

AVT cameras support a number of standard and extended features. The table below identifies a selection of interesting capabilities of the Prosilica GC camera family.

www

A complete listing of camera controls, including control definitions can be found online:

PvAPI users: AVT GigE Camera and Driver Attributes document

VIMBA users: AVT GigE Camera and Driver Features document

Control	Description
Gain control	Manual and auto
Exposure control	Manual and auto
White balance	Red and blue channel; manual and auto control
External trigger event	Rising edge, falling edge, any edge, level high, level low
External trigger delay	0 to 60 s; 1 µs increments
Fixed rate control	0.001 fps to maximum frame rate
Imaging modes	Free-running, external trigger, fixed rate, software trigger
Sync out modes	Trigger ready, trigger input, exposing, readout, imaging, strobe, GPO
Region of interest	Independent x and y control with 1 pixel resolution
Multicast	Streaming to multiple computers
Event channel	In-camera events including exposure start and trigger are asynchronously broadcasted to the host computer
Chunk data	Captured images are bundled with attribute information such as exposure and gain value
Color matrix	Correct color rendering for specific color temperature
Gamma, Hue, Saturation	Adjust image gamma, hue and saturation
Precision Time Protocol IEEE1588	Synchronize clocks of multiple cameras using multicast messaging
Lens control	Control P-iris lenses

Table 17: Prosilica GC camera and driver attribute highlights

Filter

All Prosilica GC color models are equipped with an infrared block filter (IR filter). This filter is employed to prevent infrared wavelength photons from passing to the sensor. In the absence of IR filter, images are dominated by red and incapable of being properly color balanced. Monochrome cameras do not employ an IR filter.

The figure below shows the filter transmission response for the IRC30 filter employed in the Prosilica GC cameras.

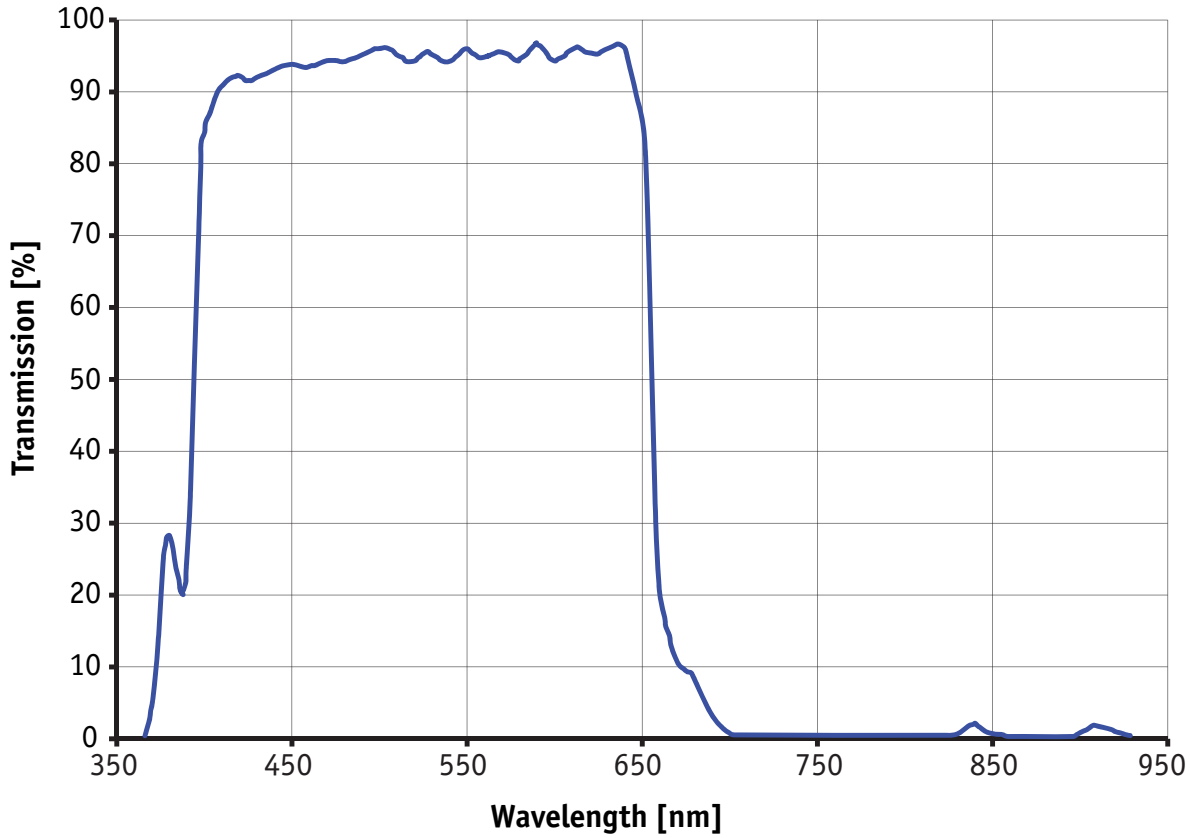


Figure 28: IRC30 filter transmission response

Camera dimensions

The Prosilica GC family offers both CCD and CMOS sensor models. CCD cameras utilize additional circuitry required for A/D conversion. As a result, CMOS models offer a shorter mechanical package then CCD models.

Prosilica GC750, GC1280

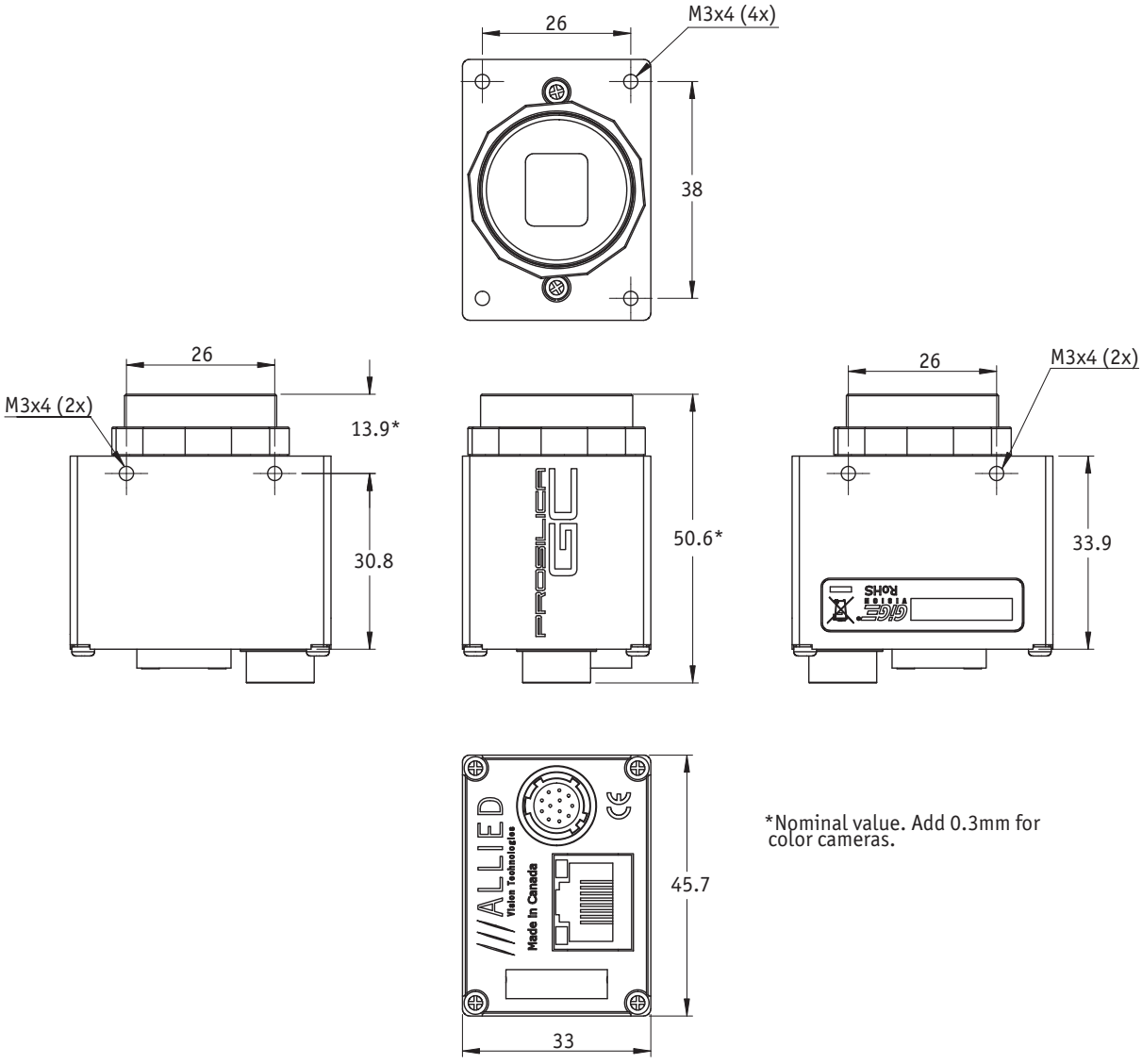


Figure 29: Mechanical dimensions for Prosilica GC750, and GC1280

Prosilica GC CCD models:

GC650/C, GC655/C, GC660/C, GC780C, GC1020/C, GC1290/C, GC1350/C, GC1380/C, GC1380H/C, GC1600/C, GC1600H/C, GC2450/C

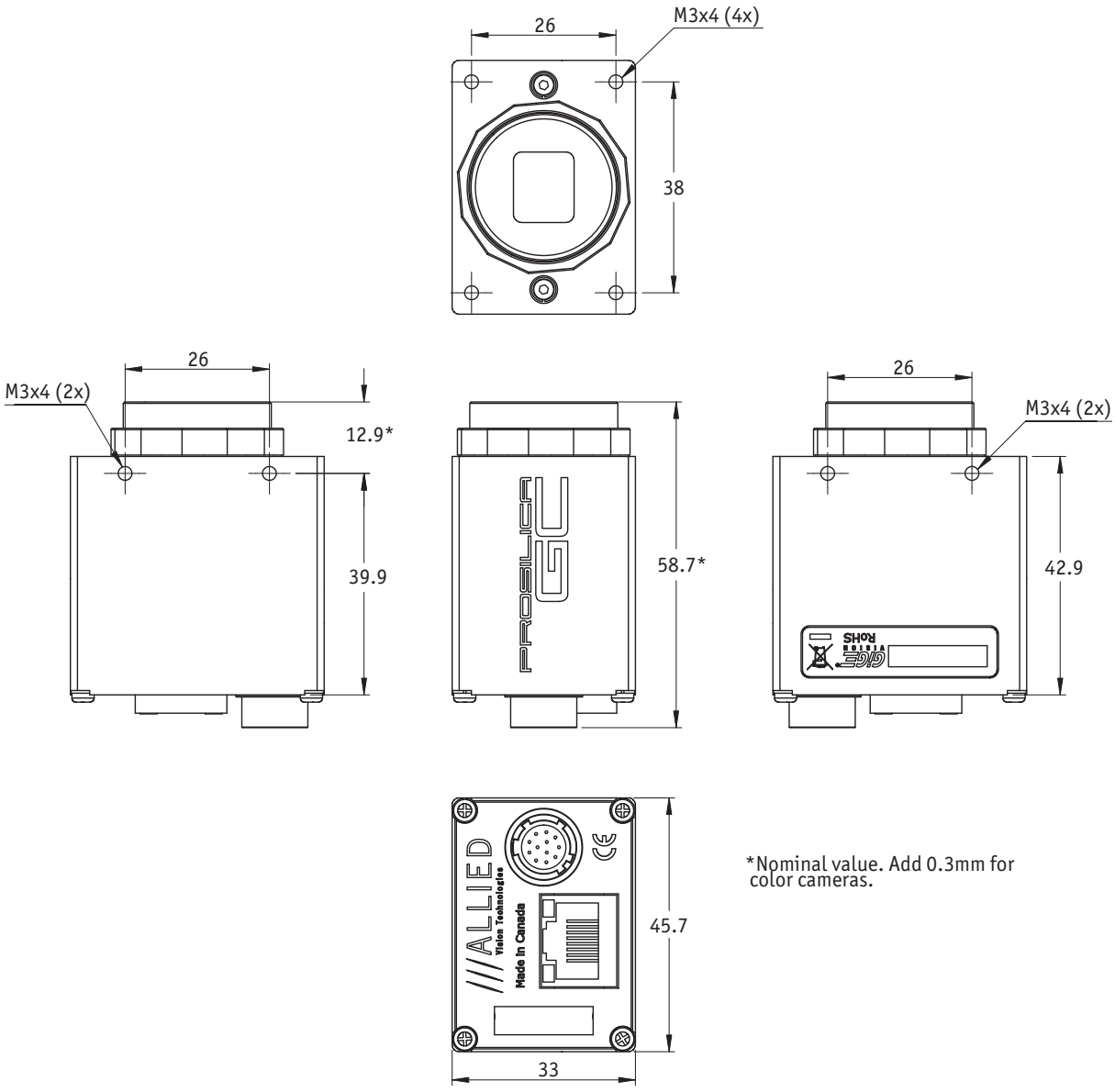


Figure 30: Prosilica GC CCD models mechanical dimensions

Tripod adapter

A **Prosilica GC** camera can be mounted on a camera tripod by using mounting plate P/N 02-5002A. The same mounting plate can be used for all models within the GC camera family.

Note Contact your AVT sales representative to purchase GC mounting plate 02-5002A.

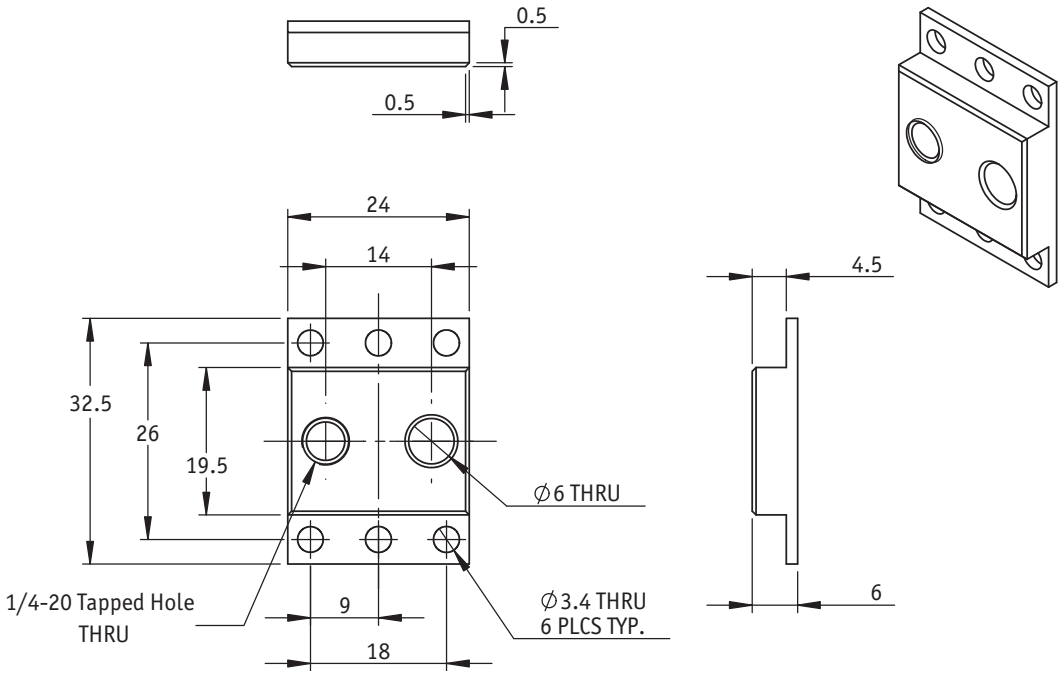


Figure 31: Prosilica GC tripod mount mechanical drawing

Adjustment of C/CS-Mount

www

Cameras are shipped with adjustable C-Mount or CS-Mount depending on sensor size and camera order code. See **AVT Modular Concept** for more information:

http://www.alliedvisiontec.com/us/support/downloads/product-literature/avt-modular-concept.html

The C-Mount or CS-Mount is adjusted at the factory and should not require adjusting. If for some reason the lens mount requires adjustment, use the following method.

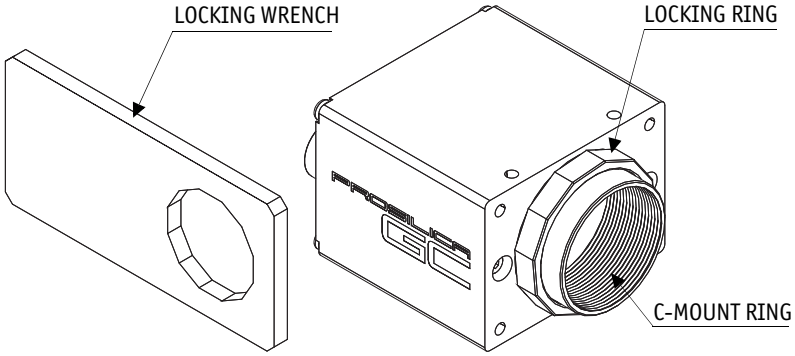


Figure 32: Prosilica GC camera and locking wrench

Loosen locking ring

Use an adjustable wrench to loosen the locking ring. Be careful not to scratch the camera. When the locking ring is loose, unthread the ring a few turns from the camera face.

Note

A wrench suitable for this procedure is available for purchase from AVT.
AVT P/N: 02-5003A

Image to infinity

Use a C-Mount compatible lens (CS-Mount compatible lens, if using CS ring) that allows an infinity focus. Set the lens to infinity and image a distant object—10 to 15 m should suffice. Make sure the lens is firmly threaded onto the C-Mount ring. Rotate the lens and C-Mount ring until the image is focused. Carefully tighten the locking ring and recheck focus.

Camera interfaces

This chapter provides information on Gigabit Ethernet port, inputs and outputs, and trigger features.

www

For more information on GigE accessories:
http://www.alliedvisiontec.com/emea/products/accessories/gige-accessories.html

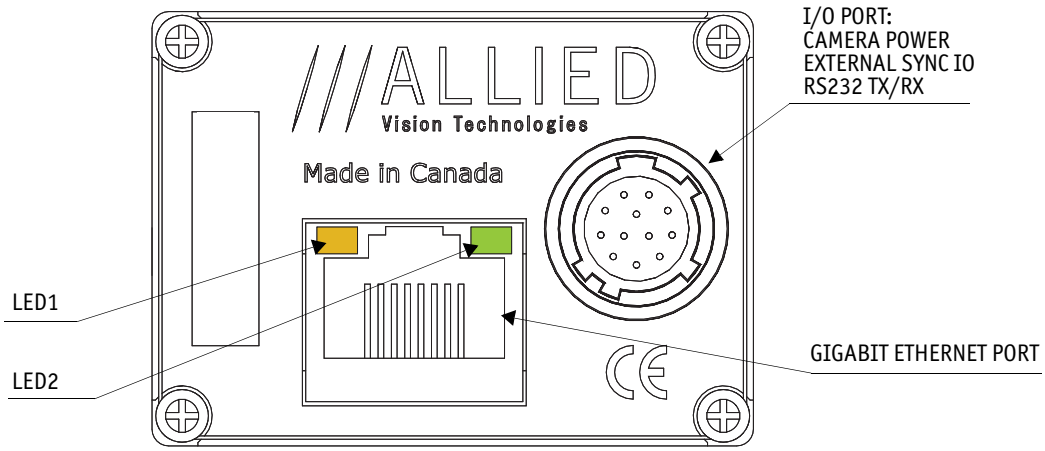


Figure 33: Prosilica GC connection ports

Status LEDs

The color of the LEDs have the following meaning:

	LED Color	Status
LED1	Flashing / solid orange	Ethernet activity
LED2	Flashing green	Camera is powered
	Solid green	Camera is booted, and link with the host is established

Table 18: Status of LEDs in Prosilica GC

Note

Once the camera is booted, LED2 will remain solid green as long as the camera is powered, even if connection with the host is lost.

Gigabit Ethernet port

The Gigabit Ethernet port conforms to the IEEE 802.3 1000BASE-T standard for Gigabit Ethernet over copper. We recommend using Category 6 or higher compatible cabling and connectors for best performance.

www

The **AVT GigE Installation Manual** offers detailed instructions for using Prosilica GC cameras.

http://www.alliedvisiontec.com/fileadmin/content/PDF/Products/Technical_Manual/GigE_Install_Manual/AVT_GigE_Installation_Manual.pdf

Note

See **Hardware Selection for AVT GigE Cameras** application note for a list of recommended Ethernet adapters:

http://www.alliedvisiontec.com/fileadmin/content/PDF/Support/Application_Notes/Hardware_Selection_for_AVT_GigE_Cameras.pdf

A standard Ethernet adapter is available for purchase from AVT:
AVT P/N: 02-3002A
Model: Intel Pro 1000/PT

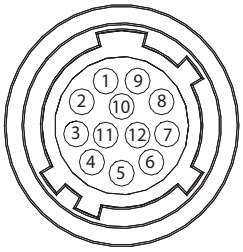
Note

Cable lengths up to 100 m are supported.

The 8-pin RJ-45 jack has the pin assignment according to the Ethernet standard (IEEE 802.3 1000BASE-T).

Cables with screw-lock connectors are available for purchase from AVT:
http://www.alliedvisiontec.com/emea/products/accessories/gige-accessories.html

Camera I/O connector pin assignment



Pin	Signal	Direction	Level	Description
1	Camera GND	In	GND for ext. power	Ground for camera power supply
2	Camera Power	In	5–16* VDC	Camera power supply
3	In 1	In	U_{in}(high) = 5–24 V U_{in}(low) = 0–0.8 V	Input 1 opto-isolated (SyncIn1)
4	Out 1	Out	Open emitter max. 20 mA	Output 1 opto-isolated (SyncOut1)
5	Isolated IO GND	In/Out	Common GND for In/Out	Isolated input and output signal ground
6	Video iris	Out	---	PWM signal for iris control
7	Reserved	---	---	---
8	TxD RS-232	Out	RS-232	Terminal transmit data
9	RxD RS-232	In	RS-232	Terminal receive data
10	Signal GND	---	---	Ground for RS232 and non-isolated IO
11	In 2	In	LVTTL max. 3.3 V	Input 2 non-isolated (SyncIn2)
12	Out 2	Out	LVTTL max. 3.3 V	Output 2 non-isolated (SyncOut2)
*Some models offer 5-25 VDC. See Camera power section for details.				

Figure 34: Camera I/O connector pin assignment

The general purpose I/O port uses a Hirose HR10A-10R-12PB connector on the camera side. The mating cable connector is Hirose HR10A-10P-12S.

Note

The cable side Hirose connector is available for purchase from AVT.
AVT P/N: K7600040 or 02-7002A

I/O definition

Camera power

The Prosilica GC camera family has recently been updated to offer an expanded input power voltage range. The camera serial number is used to differentiate between cameras that offer 5–16 VDC and those that offer 5– 25 VDC.

Caution

SN: 02-XXXXX-**0**XXXX, 5– 16 V. 12 V nominal.

SN: 02-XXXXX-**1**XXXX, 5– 25 V. 12 V nominal.

www

For more information on the power voltage range update for the Prosilica GC family:

http://www.alliedvisiontec.com/fileadmin/content/PDF/Support/Application_Notes/Technical_Note_-_Prosilica_GC_power_voltage_specification_update.pdf

Note

A 12 V power adapter with Hirose connector is available for purchase from AVT:

- AVT P/N 02-8003A North America Supply.
- AVT P/N 02-8004A Universal Supply.

Isolated IO ground

The **Isolated IO GND** connection provides the user ground reference and return path for **In 1**, and **Out 1**. It is recommended that the ground wiring be physically close to the **In/Out** wiring to prevent parasitic coupling. For example, a good cable design connects **In 1** to one conductor of a twisted pair, **Isolated IO GND** to the second conductor of the same twisted pair.

RxD RS-232 and TxD RS-232

These signals are RS-232 compatible. These signals are not optically isolated. Tie RS-232 ground to **Signal GND** to complete the RS-232 circuit.

www

For complete RS-232 description and usage, see:

http://www.alliedvisiontec.com/fileadmin/content/PDF/Support/Application_Notes/AppNote_-_RS-232_AVT_GigE.pdf

Input triggers

Input triggers allow the camera to be synchronized to an external event. The camera can be programmed to trigger on the rising edge, falling edge, both edges, or level of the signal. The camera can also be programmed to capture an image at some programmable delay time after the trigger event.

In 1 – opto-isolated

In 1 is optically isolated and can be used in electrically noisy environments to prevent false trigger events. Tie trigger ground to **Isolated IO GND** to complete the trigger circuit. Compared to the non-isolated trigger, **In 1** has a longer propagation time. It can be driven from **5 to 24 V** with a **minimum current source of 10 mA**. See Camera I/O opto-isolated user circuit example for wiring information.

In 2 – non-isolated

In 2 is not electrically isolated and can be used when environmental noise is inconsequential and faster trigger response is required. The required trigger signal is **low voltage TTL 3.3 V.** Tie trigger ground to **Signal GND** to complete the trigger circuit. See Camera I/O non-isolated user circuit example for wiring information.

Caution Exceeding 5.1 V on **In 2** can permanently damage the camera.

Output signals

Output signals can be assigned to a variety of internal camera signals via software. They can be configured to active high or active low. The internal camera signals are listed as follows:

Exposing	Corresponds to when camera is integrating light.
Trigger Ready	Indicates when the camera is ready to accept a trigger signal.
Trigger Input	A relay of the trigger input signal used to “daisy chain” the trigger signal for multiple cameras.
Readout	Valid when camera is reading out data.
Imaging	Valid when camera is exposing or reading out.
Strobe	Programmable pulse based on one of the above events.
GPO	User programmable binary output.

Out 1 – opto-isolated

Out 1 signal is optically isolated and requires a user voltage with a suitable pull up resistor. Tie signal ground to **Isolated IO GND** to complete the external circuit. See Camera I/O opto-isolated user circuit example for wiring information.

Out 2– non-isolated

Out 2 signal is not electrically isolated and can be used when environmental electrical noise is inconsequential and faster trigger response is required. Use **Signal GND** to complete the external circuit. The output signal is a **low voltage TTL, maximum 3.3 V**. **Not suitable for driving loads in excess of 24 mA**. See Camera I/O non-isolated user circuit example for wiring information.

Signal ground

Signal Ground must be connected to the user's external circuit ground if **In 2** or **Out 2** is to be used, or if the RS-232 port is to be used. Note that **Signal Ground** is common with **Camera GND**; however, it is good practice to provide a separate ground connection for power and signal.

Video iris

This signal can be used to drive the video input of a video iris lens. See Video iris output description section for wiring information.

Reserved

These signals are reserved for future use and should be left disconnected.

Video iris output description

Prosilica GC cameras provide built-in auto iris controls for controlling video-type auto-iris lenses. These lenses are available from many popular security lens companies including Pentax, Fujinon, Tamron, Schneider, etc.

Remote iris lens control allows the camera to be more adaptable to changing light conditions. It allows the user to manually control the exposure and gain values and rely solely on the auto iris for adjustment to ambient lighting.

Caution

The following schematic uses CAMERA POWER to power the video iris lens, and assumes CAMERA POWER = 12 V. Most video iris lenses operate at a 8–16 V input voltage. **Therefore, this circuit is not appropriate if using a 24 V camera power supply. Doing so may irreparably damage your lens**. Please consult your video iris lens specifications for the appropriate drive voltage.

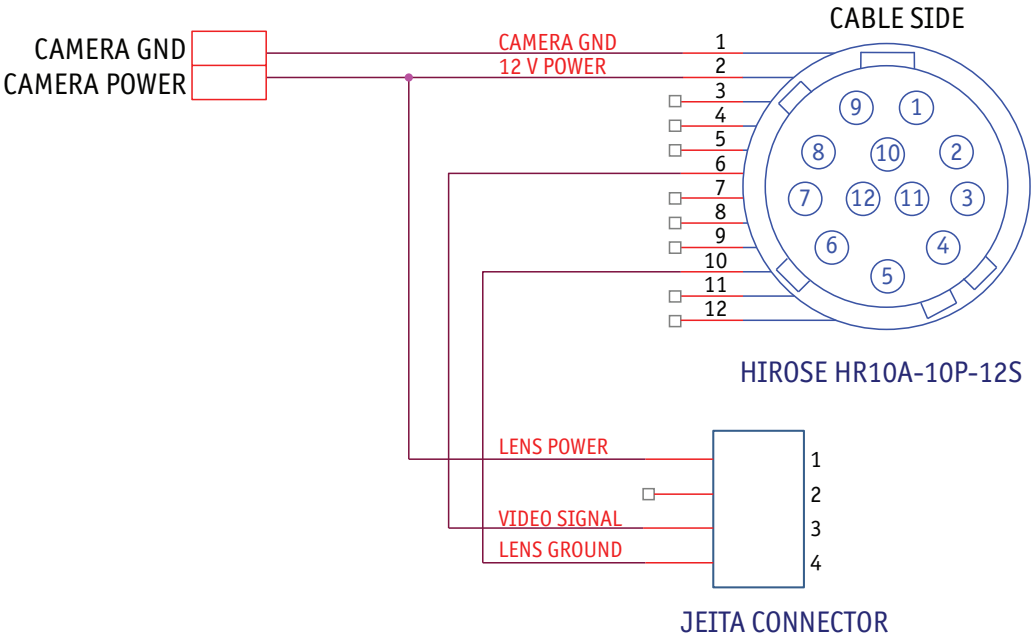
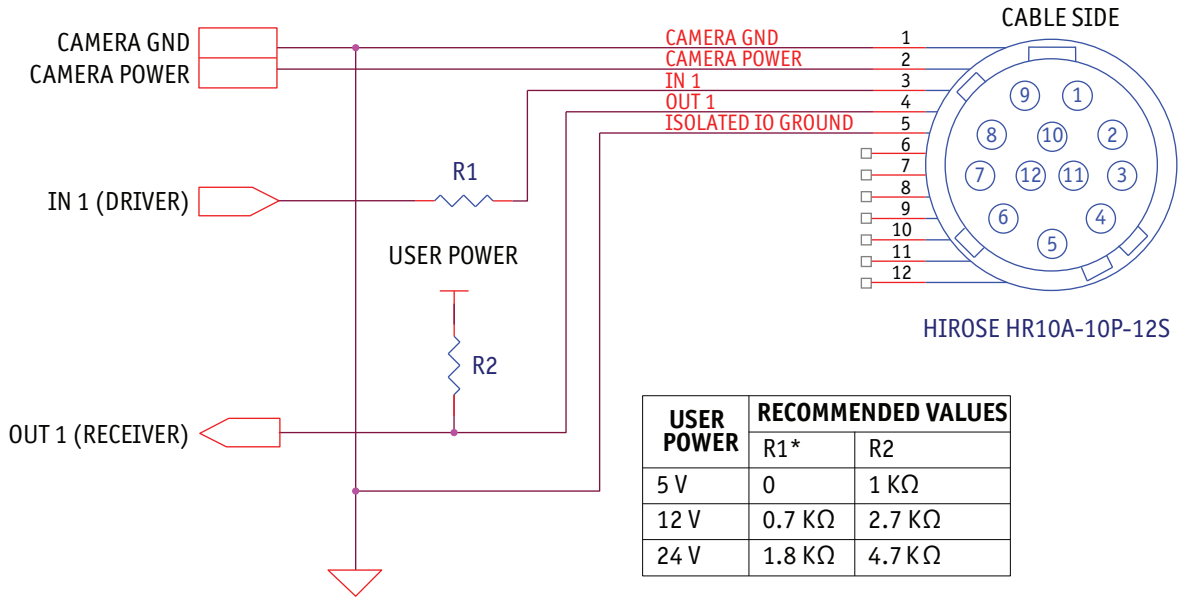


Figure 35: Prosilica GC video iris schematic

Camera trigger

Camera I/O opto-isolated user circuit example



USER POWER	RECOMMENDED VALUES	
	R1*	R2
5 V	0	1 KΩ
12 V	0.7 KΩ	2.7 KΩ
24 V	1.8 KΩ	4.7 KΩ

Figure 36: Prosilica GC opto-isolated user circuit

*Cameras with SN: 02-XXXXX-**0**XXXX, R1 necessary for input greater than 5 V.
Cameras with SN: 02-XXXXX-**1**XXXX, no R1 necessary, 5–24 V.

Caution

Input: Incoming trigger must be able to source 10 mA.

Output: User power, with pull-up resistor R2 is required.

Isolated output is connected to the open collector of Fairchild MOCD207. The corresponding transistor emitter is connected to isolated ground. See the Fairchild MOCD207 datasheet for more detailed information.

Camera I/O non-isolated user circuit example

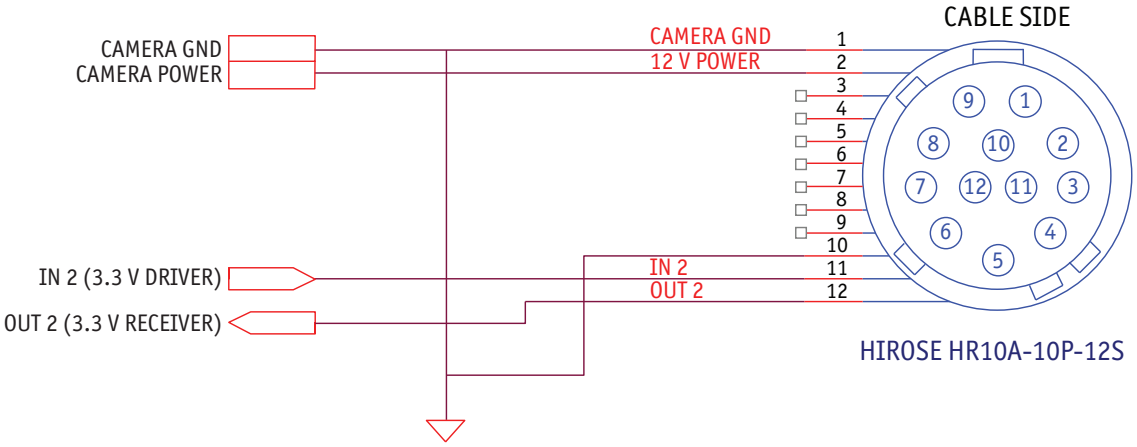


Figure 37: Prosilica GC non-isolated user circuit

Caution

Input: Incoming trigger must be able to source 10 µA, at 3.3 V. Input trigger voltage greater than 5.5 V will damage the camera.

Output: The maximum sync output current is 24 mA, at 3.3 V.

The non-isolated trigger circuit is connected to a Texas Instruments SN74LVC2G241 buffer/driver inside the camera. See the Texas Instruments SN74LVC2G241 for more detailed information.

Trigger timing diagram

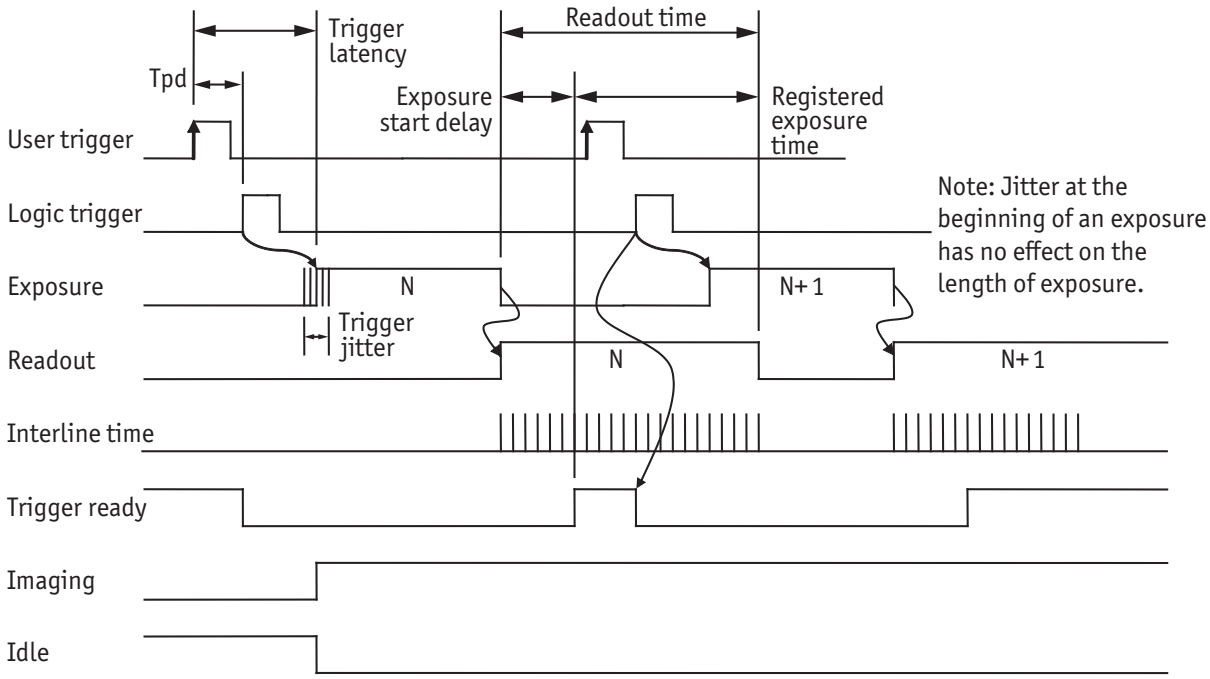


Figure 38: Prosilica GC internal signal timing waveforms

Notes on triggering

Term	Definition
User trigger	Trigger signal applied by the user (hardware trigger, software trigger)
Logic trigger	Trigger signal seen by the camera internal logic (not visible to the user)
Tpd	Propagation delay between the user trigger and the logic trigger
Exposure	High when the camera image sensor is integrating light
Readout	High when the camera image sensor is reading out data
Trigger latency	Time delay between the user trigger and the start of exposure
Trigger jitter	Error in the trigger latency time

Table 19: Explanation of signals in timing diagram

Term	Definition
Trigger ready	Indicates to the user that the camera will accept the next trigger
Registered exposure time	Exposure time value currently stored in the camera memory
Exposure start delay	Registered exposure time subtracted from the read-out time and indicates when the next exposure cycle can begin such that the exposure will end after the current readout
Interline time	Time between sensor row readout cycles
Imaging	High when the camera image sensor is either exposing and/or reading out data
Idle	High if the camera image sensor is not exposing and/or reading out data

Table 19: Explanation of signals in timing diagram

Trigger rules

Note

The **user trigger pulse width** should be at least three times the width of the trigger latency as indicated in Chapter Specifications on page 12.

- The **end of exposure** will always trigger the next readout.
- The **end of exposure** must always end after the current readout.
- The **start of exposure** must always correspond with the interline time if readout is true.
- **Exposure start delay** equals the readout time minus the registered exposure time.

Triggering during the idle state

For applications requiring the shortest possible *Trigger Latency* and the smallest possible *Trigger Jitter* the *User Trigger* signal should be applied when *Imaging* is false and *Idle* is true. In this case, *Trigger Latency* and *Trigger Jitter* are as indicated in the camera specifications section.

Triggering during the readout state

For applications requiring the fastest triggering cycle time whereby the camera image sensor is exposing and reading out simultaneously, apply the *User Trigger* signal as soon as a valid *Trigger Ready* is detected. In this case, *Trigger Latency* and *Trigger Jitter* can be up to 1 row time since *Exposure* must always begin on an *Interline* boundary.

Firmware update

Firmware updates are carried out via the GigE connection. AVT provides an application for all Prosilica GC cameras that loads firmware to the camera using a simple interface. New feature introductions and product improvements motivate new firmware releases. All users are encouraged to use the newest firmware available and complete the firmware update if necessary.

www

Download the latest GigE firmware loader from the AVT website:
http://www.alliedvisiontec.com/us/support/downloads/firmware.html

www

For more information on GigE firmware update:
http://www.alliedvisiontec.com/fileadmin/content/PDF/Support/Application_Notes/AppNote_-_GigE_Firmware_Update.pdf

Resolution and ROI frame rates

This section charts the resulting frame rate from changing sensor region of interest (ROI), from full image to a single line.

Note

- Frame rate data was generated using **StreamBytesPerSecond = 124 MB/s** and an 8-bit pixel format such as Mono8, BayerBG8, or BayerRG8. Frame rates may be lower if using network hardware incapable of 124 MB/s.
- The camera frame rate can be increased by reducing the camera's Height attribute, resulting in a decreased region of interest (ROI) or “window”.
- The camera frame rate can also be increased by increasing the camera's BinningY attribute, resulting in a vertically scaled image (less overall height with same field of view).
- There is no frame rate increase with reduced width.

Prosilica GC650

$$\text{Frame rate} = \frac{1}{19.94\ \mu s \times \text{Height} + 1224.13\ \mu s}$$

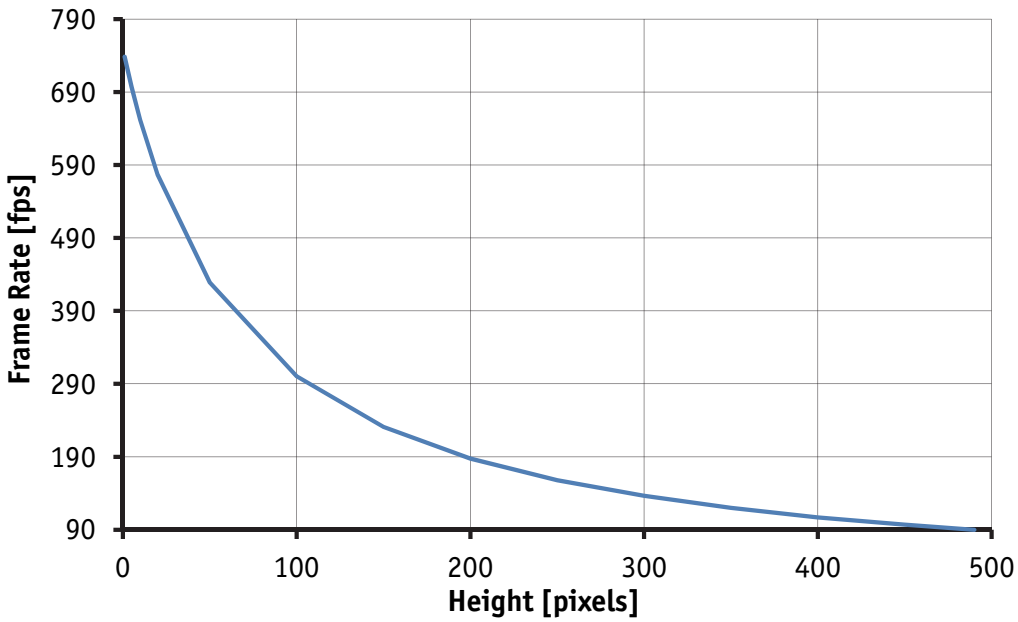


Figure 39: Frame rate vs. height for Prosilica GC650

Prosilica GC655

$$\text{Frame rate} = \frac{1}{19.94\ \mu s \times \text{Height} + 1224.14\ \mu s}$$

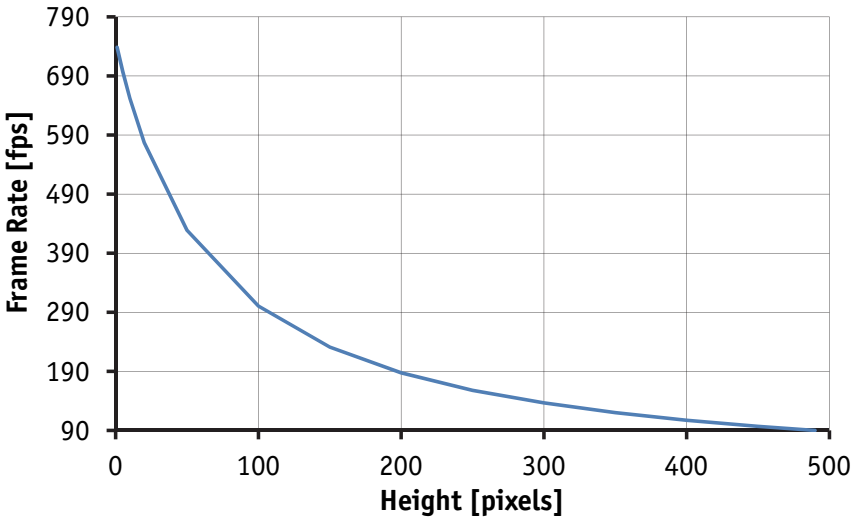


Figure 40: Frame rate vs. height for Prosilica GC655 (empirical)

Prosilica GC660

$$\text{Frame rate} = \frac{1}{13.28\ \mu s \times \text{Height} + 1844.77\ \mu s}$$

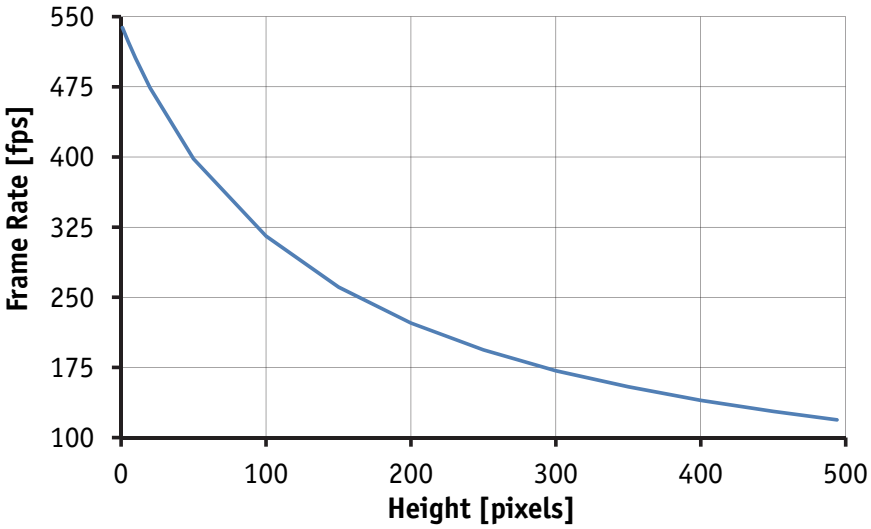


Figure 41: Frame rate vs. height for Prosilica GC660

Prosilica GC750

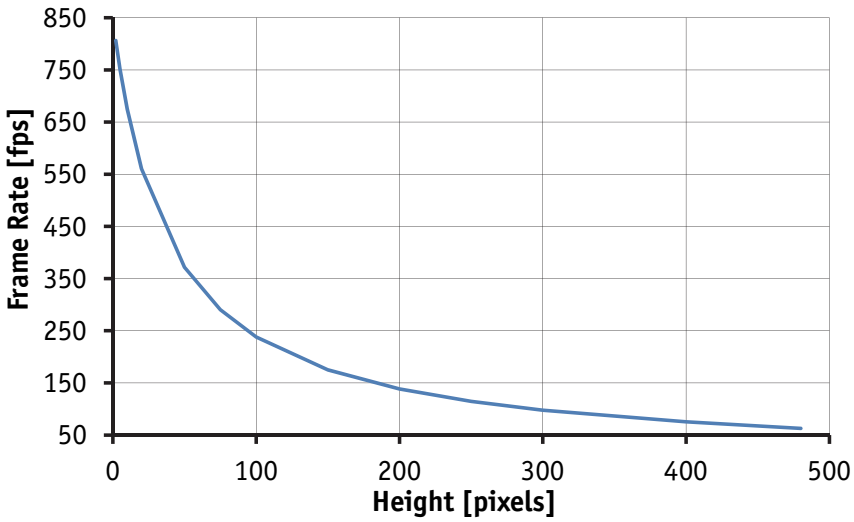


Figure 42: Frame rate vs. height for Prosilica GC750

Prosilica GC780

$$\text{Frame rate} = \frac{1}{24.70\ \mu s \times \text{Height} + 1139.14\ \mu s}$$

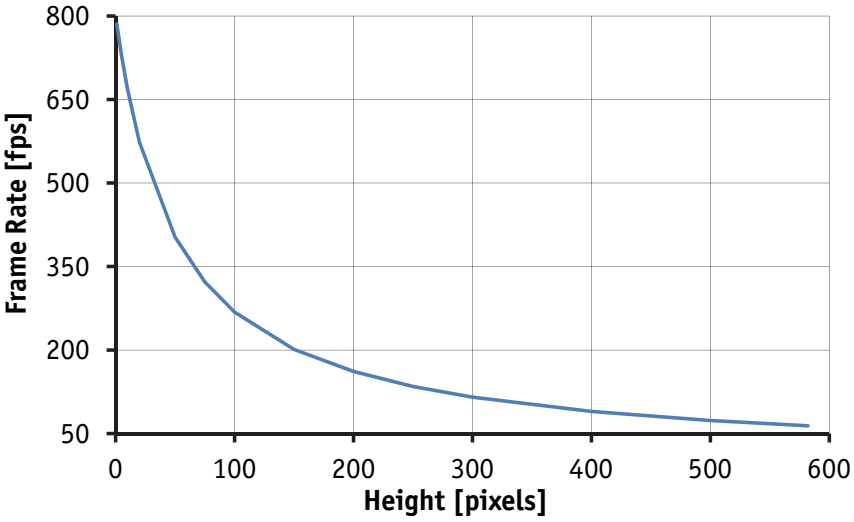


Figure 43: Frame rate vs. height for Prosilica GC780

Prosilica GC1020

$$\text{Frame rate} = \frac{1}{33.56\ \mu s \times \text{Height} + 3971.23\ \mu s}$$

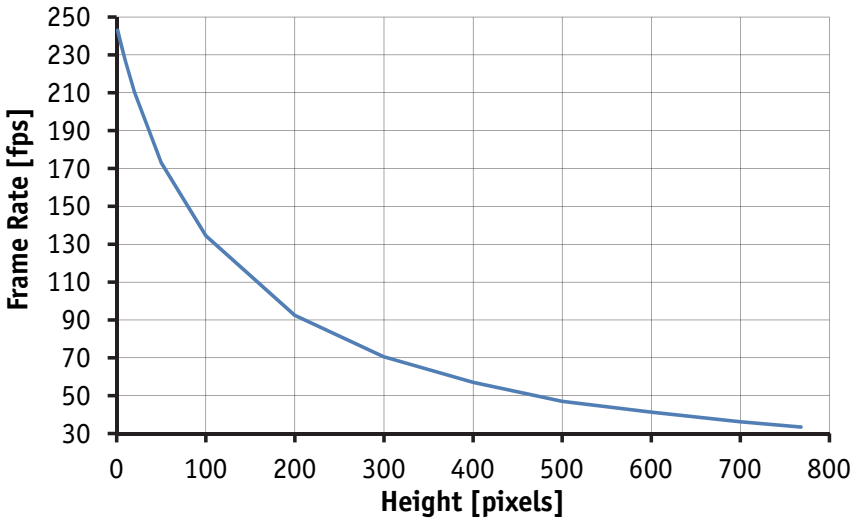


Figure 44: Frame rate vs. height for Prosilica GC1020

Prosilica GC1280

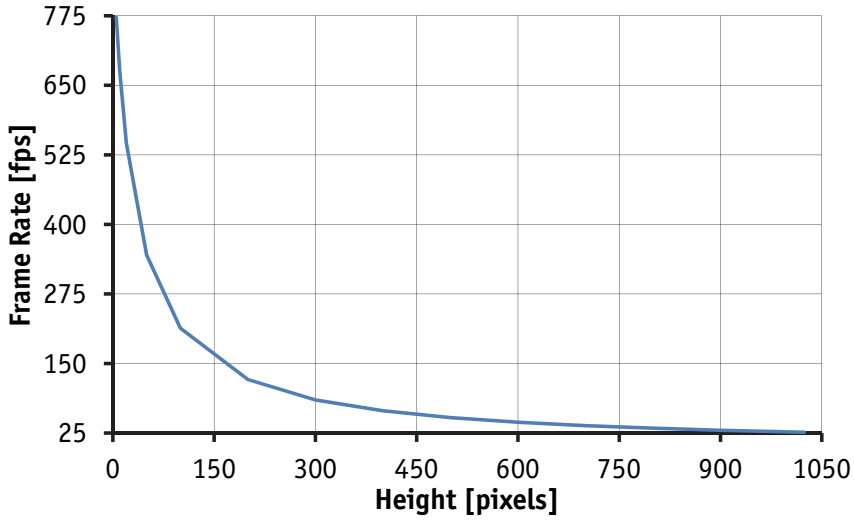


Figure 45: Frame rate vs. height for Prosilica GC1280

Prosilica GC1290

$$\text{Frame rate} = \frac{1}{28.79\ \mu s \times \text{Height} + 2937.68\ \mu s}$$

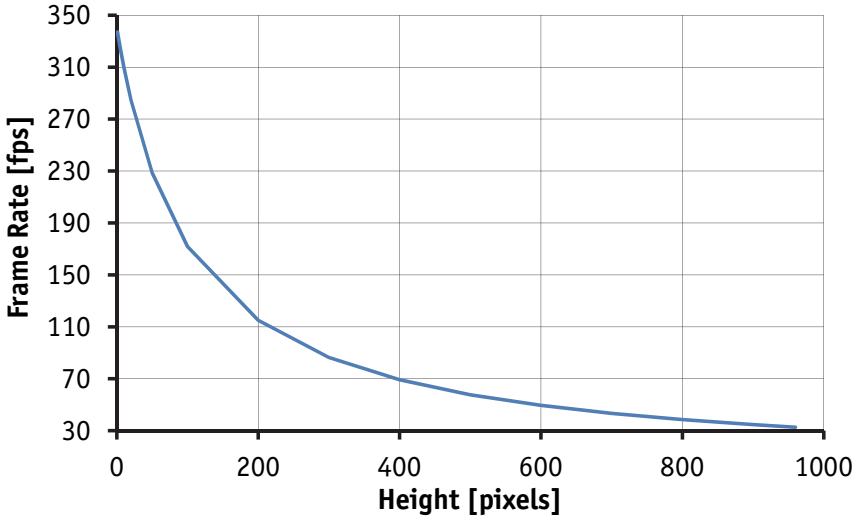


Figure 46: Frame rate vs. height for Prosilica GC1290

Prosilica GC1350

$$\text{Frame rate} = \frac{1}{38.35\ \mu s \times \text{Height} + 10457.12\ \mu s}$$

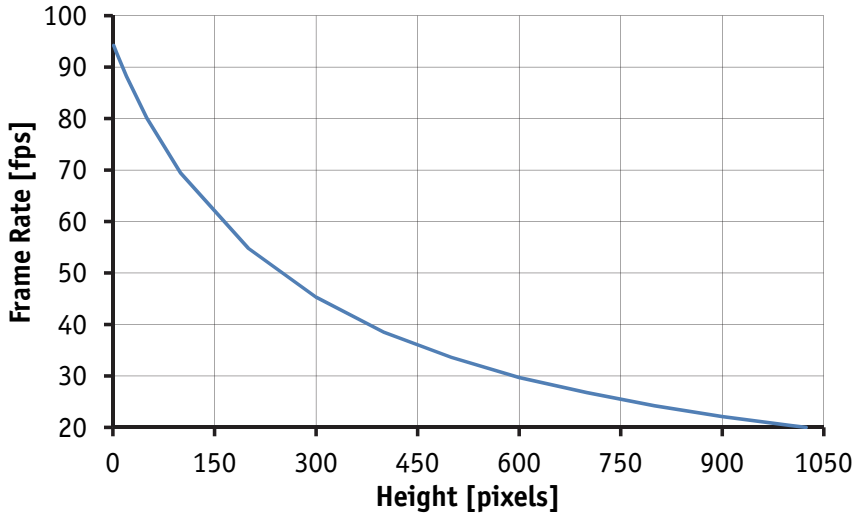


Figure 47: Frame rate vs. height for Prosilica GC1350

Prosilica GC1380

$$\text{Frame rate} = \frac{1}{41.45\ \mu s \times \text{Height} + 7148.57\ \mu s}$$

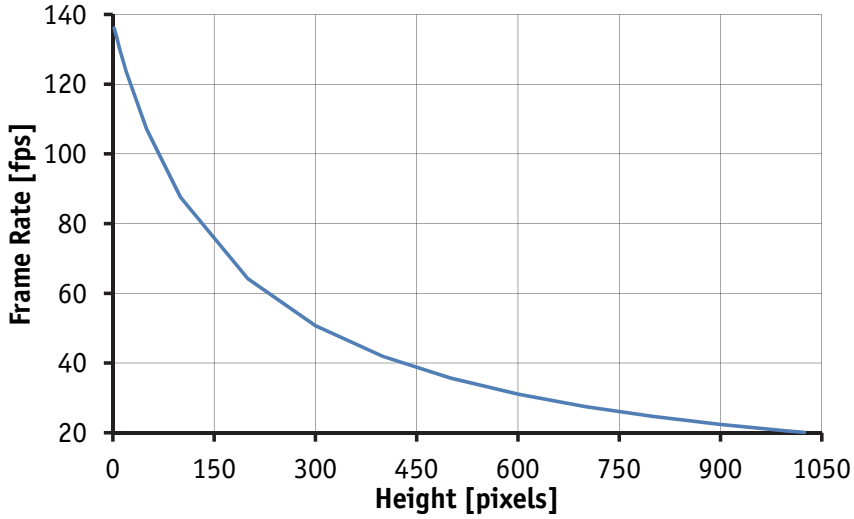


Figure 48: Frame rate vs. height for Prosilica GC1380

Prosilica GC1380H

$$\text{Frame rate} = \frac{1}{27.78\ \mu s \times \text{Height} + 4883.81\ \mu s}$$

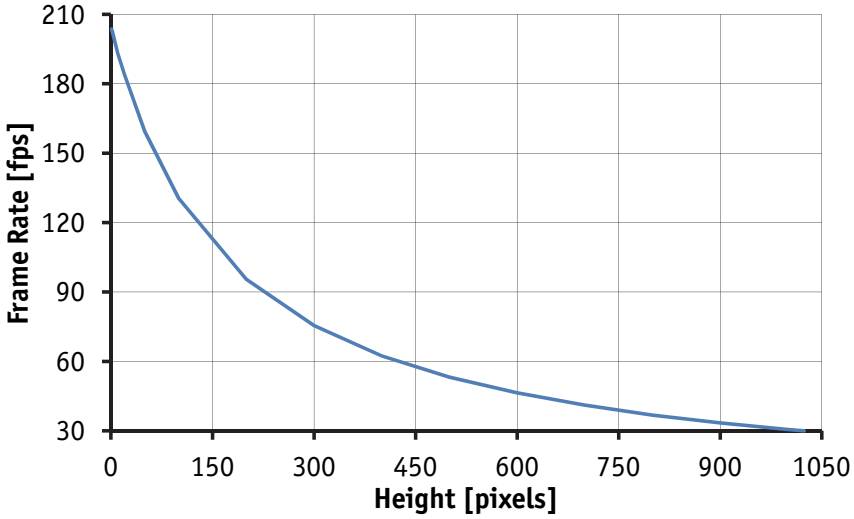


Figure 49: Frame rate vs. height for Prosilica GC1380H

Prosilica GC1600

$$\text{Frame rate} = \frac{1}{48.80\ \mu s \times \text{Height} + 6431.90\ \mu s}$$

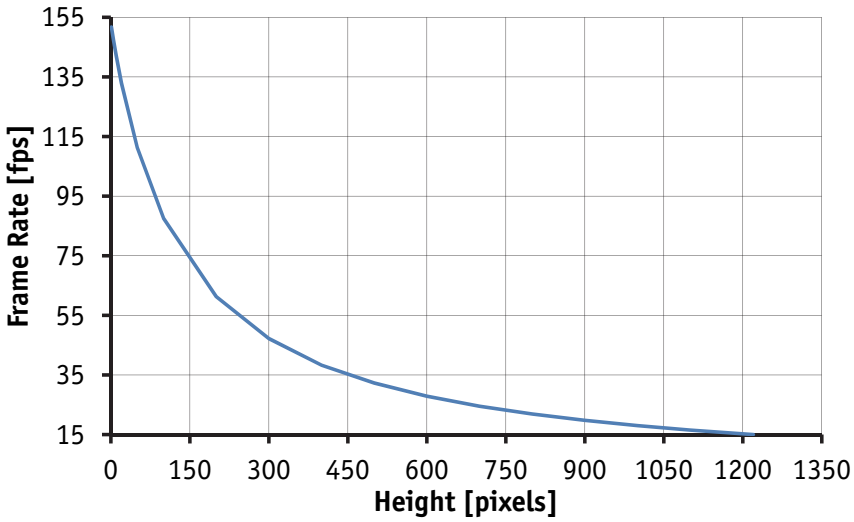


Figure 50: Frame rate vs. height for Prosilica GC1600

Prosilica GC1600H

$$\text{Frame rate} = \frac{1}{29.24\ \mu s \times \text{Height} + 3082.14\ \mu s}$$

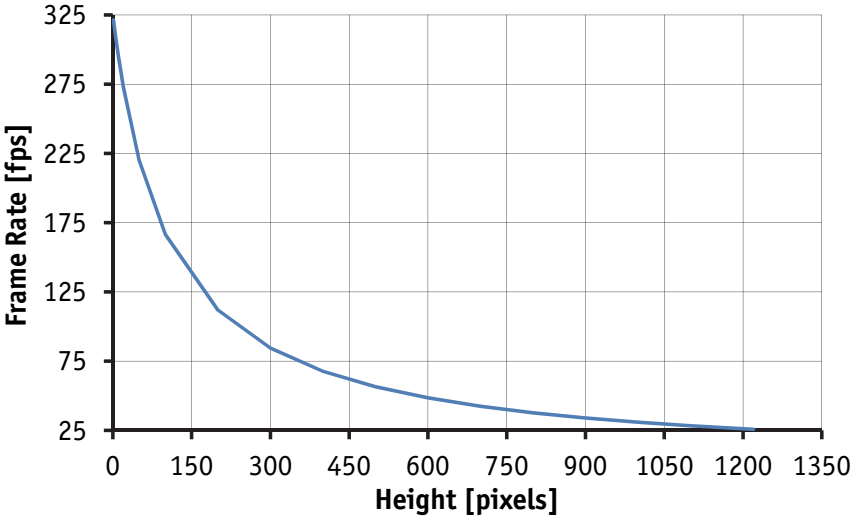


Figure 51: Frame rate vs. height for Prosilica GC1600H

Prosilica GC2450

$$\text{Frame rate} = \frac{1}{26.63\ \mu s \times \text{Height} + 12079.91\ \mu s}$$

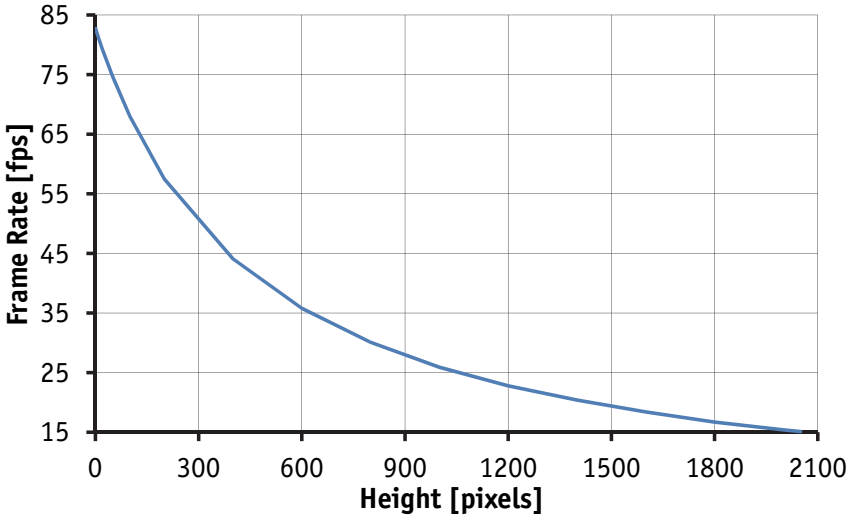


Figure 52: Frame rate vs. height for Prosilica GC2450

Prosilica GC model comparison

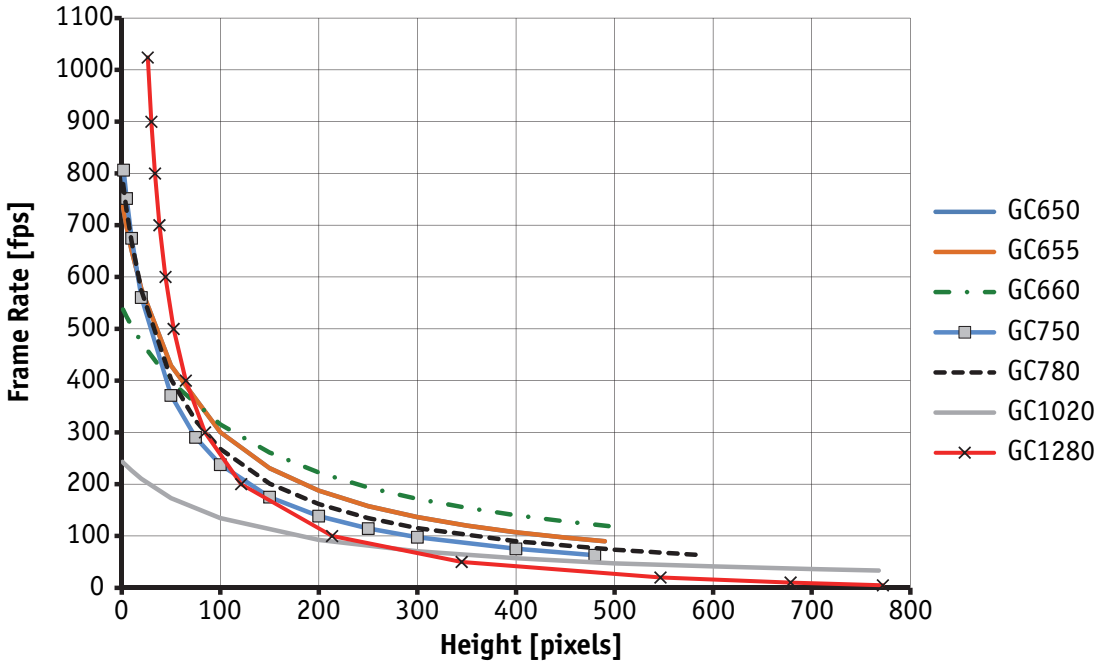


Figure 53: Maximum frame rate comparison for select models

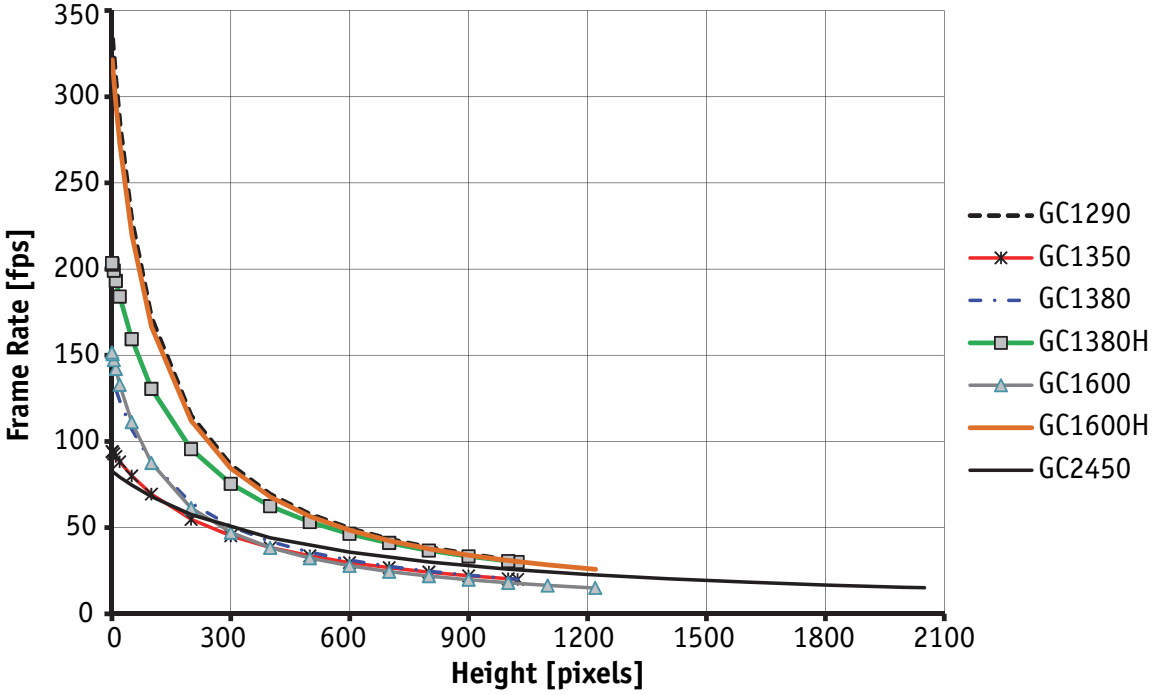
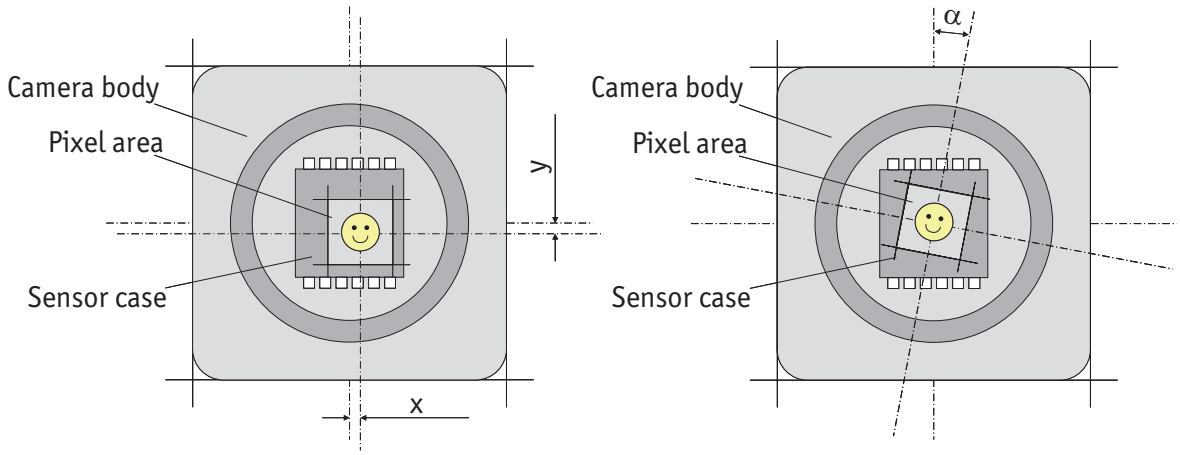


Figure 54: Maximum frame rate comparison for select models

Appendix

Sensor position of Prosilica GC cameras



Method of Positioning:	Video alignment of photo sensitive sensor area into camera front module. (lens mount front flange)		
Reference points:	Sensor: Center of pixel area (photo sensitive cells) Camera: Center of camera front flange (outer case edges)		
Accuracy:	x/y	±400 µm	(Sensor shift)
	α	± 1°	(Sensor rotation)

Additional references

Prosilica GC webpage

http://www.alliedvisiontec.com/us/products/cameras/gigabit-ethernet/prosilica-gc.html

Prosilica GC Documentation

http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-gc.html

AVT VIMBA SDK

http://www.alliedvisiontec.com/us/products/software/vimba-sdk.html

AVT GigE PvAPI SDK

http://www.alliedvisiontec.com/us/products/software/avt-pvapi-sdk.html

AVT Knowledge Base

http://www.alliedvisiontec.com/us/support/knowledge-base.html

AVT Case Studies

http://www.alliedvisiontec.com/us/products/application-markets/industrial-inspection.html

Prosilica GC Firmware

http://www.alliedvisiontec.com/us/support/downloads/firmware.html

Index

C

Camera dimensions 42
Camera GND..... 48, 51
Camera interfaces 46
Camera Power 48
CE..... 11
Cleaning optics 9
Copyright..... 2

D

Declaration of conformity..... 11
Document history 6

E

Environmental specifications 8
Exposing (trigger) 56
Exposure (definition) 55
Exposure cycle (trigger)..... 56
Exposure start delay (signal) 56

F

FCC Class A 11

G

GND for ext. power..... 48

I

Idle (signal) 56
Imaging (signal) 56
Input triggers
  In 1 ..... 48, 49, 50
  In 2 ..... 48, 50, 51
Integrating light (trigger) 55
Interline boundary..... 56
Interline time (signal)..... 56
Isolated IO GND..... 48, 50, 51
Isolated IO ground..... 49

L

Legal notice 2
Logic trigger (definition) 55

M

Mechanical Drawing
  Prosilica GC CCD models..... 43
  Prosilica GC CMOS models 42
  Prosilica GC tripod mount 44
Multicast 40

O

Output signals
  Out 1 ..... 48, 49, 51
  Out 2 ..... 48, 51

P

Precautions 8
Propagation delay (trigger) 55

R

Reading out data (trigger)..... 56
Readout (definition) 55
Readout data (trigger)..... 55
Region of interest..... 40, 58
Registered exposure time (signal) 56
RoHS (2011/65/EU)..... 11
RS-232 48

S

Sensor row readout cycles 56
Signal GND 48, 49, 50, 51
Specifications 12
Spectral sensitivity
  Prosilica GC1020 monochrome..... 23
  Prosilica GC1020C color..... 23
  Prosilica GC1280 monochrome..... 25
  Prosilica GC1290 monochrome..... 27
  Prosilica GC1290C color..... 27
  Prosilica GC1350 monochrome..... 29
  Prosilica GC1350C color..... 29
  Prosilica GC1380 monochrome..... 31
  Prosilica GC1380C color..... 31
  Prosilica GC1380CH color..... 33
  Prosilica GC1380H monochrome..... 33
  Prosilica GC1600 monochrome..... 35

Prosilica GC1600CH color 37
Prosilica GC1600H monochrome 37
Prosilica GC2450 color 39
Prosilica GC2450C color 39
Prosilica GC650 monochrome 13
Prosilica GC650C color 13
Prosilica GC655 monochrome 15
Prosilica GC655C color 15
Prosilica GC660 monochrome 17
Prosilica GC660C color 17
Prosilica GC750 monochrome 19
Prosilica GC750C color 19
Prosilica GC780 monochrome 21
Prosilica GC780C color 21
Spectral transmission
IRC30 filter 41
Status LEDs 46
StreamBytesPerSecond 58
Styles 7
Symbols 7

T

Time delay (trigger) 55
Tpd (definition) 55
Trademarks 2
Trigger jitter (definition) 55
Trigger latency (definition) 55
trigger latency time 55
Trigger ready (signal) 56
trigger rules 56
Trigger timing diagram 55

U

User trigger (definition) 55

V

Video Iris 48, 51

W

Warranty 2